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ART. XIX.—NOTICE OF SOME BRAZILIAN DRUGS.

BY J. CARSON, M. D.

WE have been placed in possession of specimens of a few drugs peculiar to Brazil, through the kindness of Mr. Edward Donnelly, formerly of this city, and a graduate of the College of Pharmacy of Philadelphia, but at present, a resident of Rio de Janeiro. Most of them appeared to us interesting and worthy of notice, more especially, as they are presented as remedies in the "*Formulario ou Guia Medica do Brasil.*" This work is compiled by *Dr. Chernoviz*, and is as replete with information and as carefully prepared as any of a similar kind in other languages. It in fact answers the purpose of a *Pharmacopœia* in Brazil, and to it we shall refer as each article is presented.

*Gum Angico.*

This product is derived from the *Acacia jurema* of *Martius*.

The gum occurs in rounded masses or tears, the size of a walnut, generally united in lumps presenting a nodulated appearance. The colour is reddish. The surface is somewhat rough and cracked. When broken, it is beautifully clear and transparent, and resembles gum Senegal. It is perfectly odourless, and has a mucilaginous slightly starchy taste, like tra-

gacanth. It pulverizes with some difficulty on account of its toughness; and when formed, the powder is white and pure like pulverized gum arabic. It dissolves completely, with an oily aspect in solution, but this is not very tenaceous. This gum might be used as a substitute for the ordinary gums of the shops—but we are induced to believe, that it is inferior for many purposes to which they are applied.

The bark of the tree is stated (*op. citat.*) to be a powerful astringent, and is used in the form of decoction.

#### *Fedegoso Root.*

This is stated to be the root of the *Cassia occidentalis*, L., by M. August. St. Hilaire, but by Vandelli it is referred to the *C. hirsuta*, which is closely allied to the preceding. It has herbaceous stems with opposite leaves—leaflets broadly ovate-acuminate and hirsute. The odour is disagreeable.

The root is in pieces of the thickness of the finger, ligneous internally, and covered with a thick cortical substance, hard, wrinkled and black externally. In the dried state it is almost entirely destitute of odour, and has a bitter disagreeable taste.

It has been examined by Cadet and Henry, *Journ. de Pharmacie*, vol. iii., p. 259—and vol. vi. p. 189.

In Brazil this drug is used as a febrifuge, and in the "Formulario" we are told that it is diuretic, and a mild tonic employed in dropsies. Margraff states that it is used as an antidote, (for what, is not specified,) and as a remedy in strangury.

It is employed in decoction, from 1 to 2 ounces to a pint of water. The leaves are also used. Pison informs us that the juice of them is given in injection to allay inflammation of the anus, and as an application to erysipelas.

#### *Herva Tostao.*

This is the root of the *Boerhaavia hirsuta*, Wild., a plant belonging to *Monandria*, *Monogynia*, L., and to the natural family *Nyctagineæ*.

*Calyx* very entire. *Corolla* campanulate, W. Leaves ovate,

repandate. Stem diffuse, pubescent. Fruit, sulcate, clavate, *Swartz*. It has been confounded with *B. diandra*.

The root of this plant is fusiform, elongated, thick as the finger above, very tapering to the extremity, with a number of branching radicles; brown externally, with transverse warty elevations of the cortical substance, and wrinkled spirally. Internal structure spongy, fibrous; fracture tough, and of a light colour; odor feeble; taste starchy.

In the Dictionary of Lamark the plant is known by the name of *Patagone*.

This drug is stated to be diuretic, and is employed in gonorrhœa (op. cit.) in the form of decoction, made of 2 oz. to a pint of water. Externally it is used in the form of cataplasms.

The juice of the leaves is employed in Brazil, according to Martius, in jaundice, and induration of the liver.

Other species of *Boerhaavia* are also used in the treatment of disease in Brazil, as the *B. scandens* as a diuretic, and the *B. tuberosa*, which is a purgative.

#### *Guarana.*

This, is the gum resinous concrete of the fruit of the *Pau-linia sorbilis*, of Martius. *Class Octandria, Order Trygiinia, L. Nat. Fam. Sapindaceæ.*

The plant is an inhabitant of *Para*. In the 12th vol. of this journal, page 340, will be found all that is known of the plant, in an interesting memoir by M. Virey.

The drug is prepared by the Indians of *Para*, and is in the form of cylindrical masses, elongated, and smaller towards the extremities, weighing from four to eight ounces. Externally, the surface is smooth, and of a dirty blackish brown colour. It is very hard, and breaks with a short, brittle fracture, presenting a deep brown, somewhat shining, irregular surface, a little mottled. It has no odour, and its taste is astringent, very slightly bitter, and decidedly possessed of the chocolate flavour. The powder is of a light chocolate colour.

By M. Cadet it was found that it was partly soluble in al-

cohol, partly in water, and that there remained an insipid, insoluble matter. M. Batka pointed out the existence of a peculiar principle to which has been given the name of *guaranine*. The most elaborate analysis, however, made of it, has been by M. Berthemot and Dechastelus, who determined *guarana* to contain, independently of pulp, starch, &c. a greenish oily matter, tannic acid—affording greenish ferruginous salts, and a *crystalline* substance. This latter is the *guaranine* of M. Batka, which the last mentioned experimenters have determined to be identical with *caffein*, and to be in union with tannic acid. In the "Formulario" this article is mentioned as a tonic and astringent, administered in the form of infusion or decoction. For a more detailed statement of the modes of exhibition the reader is referred to page 54, vol. 13th, of this Journal, by M. Dechastelus.

#### *Extract of Guarahem or Buranhem.*

Under this name has been sent to us the article known as *Monesia*, which two or three years since attracted the attention of the public. In the "Formulario" it is referred to a species of *Chrysophyllum*, but this is extremely questionable. For an exposition of this subject, we may refer to the notice of *Monesia* at page 152, vol. 13, of this journal.

#### *Brazilian Bark.*

The specimens which under this designation have been sent to us consist of quills from 3 or 4 to 18 inches in length, an inch in diameter, and 2 lines in thickness, either singly or doubly rolled. Externally they are covered with a smooth epidermis of a brownish or ferruginous, and somewhat micaeuous appearance, which is wrinkled from drying, and marked with transverse superficial fissures. The substance beneath, where the epidermis has been peeled off, is brown, and marked by shining minute apparently crystalline specks. Internally the surface is smooth, and of the same brown colour. The fracture is short and somewhat splintery. They have a tan-like odour, and a marked bitter taste. From the examination

to which they were subjected by Mr. Procter, no evidence of the existence of an organic base was afforded.

The plants affording a variety of barks derived from Brazil, were placed by St. Hilaire in the genus *Cinchona*, from this however they have been separated by De Candolle, and erected into a new genus under the name of *Remijia*, in honor of a surgeon named Remijo, who introduced the use of their bark in Brazil as a substitute for *Cinchona*.

Their characters are as follows: *Cal.* tube obovate, limb persistently five-cleft. *Cor.* tube terete, limb five-cleft, laciniate, linear. *Stam.* filament inserted in the middle of the tube, unequal; anthers linear, entirely included. *Capsul.* ovate, bilocular, crowned with the calyx, locularly dehiscing, or according to St. Hilaire, dehiscing from the septum; the valves bifid from the base to the apex. *Placentæ* fleshy in each cell. *Seeds* many, imbricate peltate, alated on the margin. They are Brazilian trees—hardly racemose—called *Quina de Serra*, or *Quina de Remijo*.

The leaves are oblong or ovate, coriaceous, below profoundly sulcate, opposite or ternate, revolute on the margin, beneath villose and ferruginate. Stipules lanceolate, connate at base and deciduous. Branches axillary elongated, interrupted, the fascicles of flowers opposite. Corolla on the outside tomentose.

This genus differs from *Cinchona* in the capsule, which semi-locularly dehisces; in the seeds, which are peltate, and in the inflorescence and habit. (De Cand. Prodrom. vol. 4, p. 359.) Four species that have been enumerated, are the *R. ferruginea*, *R. Vellozia*, *R. Hilarii* and *R. paniculata*. It appears to us probable that the first mentioned affords the article that has been described. It is figured in the “*Plantes usuelles des Brasiiliens*” of St. Hilaire.

In the “*Formulario*” a general notice is given of this bark, with the information that its qualities are similar to those of the Peruvian barks.

*Bark of the Paú Pereira.*

This article is referred to a species of *Vallezia* belonging to the family of *Strychneæ*. It is the inner layer of the bark, immediately in contact with the wood.

The specimens are in flat pieces eighteen inches in length, 3 in width, and 3 or 4 lines in thickness, of a light brown colour, very fibrous and stringy, with little odour, and a very bitter taste.

From the analysis of Prof. Pfaff, it appears that it contains an *alkaline principle (pereirina)*, resinous extractive, starch and a vegetable acid, with salts of potassa, lime, magnesia, &c. The discovery of the alkaloid principle is first to be attributed to Sr. Santos of Rio de Janeiro.

This drug has some reputation as a remedy in intermittent fever in Brazil, as in the hands of numerous practitioners it has proved serviceable. A preparation called "*Agua antifebril*" is used, which we presume is an infusion of it. It is employed internally and externally. (*Formulario*.)

**ART. XX.—OBSERVATIONS ON MONARDIN, A PECULIAR CRYSTALLINE SUBSTANCE, DERIVED FROM THE VOLATILE OIL OF MONARDA PUNCTATA.**

BY WILLIAM PROCTER, JR.

THE volatile oil of horsemint (*Monarda punctata*) is extensively employed in this country as a rubefacient, either by itself, or in conjunction with other substances, in the form of liniments, and from its great pungency is considered a valuable remedial agent. Several of our druggists\* have observed

\* The specimen of Monardin which furnished the material for this essay, was presented to the College of Pharmacy of this city by Edward Wayne, about a year since, with the remark that the canister from which it was taken contained a very considerable deposit of this substance. Samuel F. Troth and Charles Ellis have likewise observed this phenomenon.

in some specimens of this oil, a crystalline deposit, analagous in appearance to camphor, and possessed of the taste and odour of the oil. As no notice has been taken of this fact in any of the works to which I have had access, the subject is possessed of sufficient interest to present, in the form of an essay, a history of its sensible properties, and some of its chemical characteristics. It evidently belongs to the camphor class, and may be the result of the absorption of oxygen. It is presented in two forms; one in amorphous translucent masses with some slight evidences of lamination in the fracture; the other in rhombic crystals closely aggregated together. The amorphous variety is white, has a conchoidal fracture, is very friable, and is reduced to powder with extreme readiness. Its amorphous condition appears to be due more to the manner in which it is deposited, than to any difference in its chemical character, as when fused, and gradually cooled, it assumes the crystalline form, and comports itself in the same manner with chemical reagents. This substance, which for the purpose of facilitating its description, may be called *monardin*, possesses the burning pungent taste, and peculiar odour of the oil of horsemint, and doubtless possesses the same medical properties. Monardin is very soluble in alcohol and ether, and is dissolved by the fixed and volatile oils, particularly oil of turpentine; hence the change of the oil of horsemint to the solid state, does not preclude its use in pharmaceutical preparations. It is very slightly soluble in water, communicating to that fluid its odor and pungent taste. Monardin fuses at 118° Fahr. into a limpid oil, and when the heat is continued it commences boiling in a glass vessel at 418° Fahr., and at 438° its point of ebullition is stationary. It boils readily and without discoloration, and may be distilled *per se* without change, the vapour condensing in a crystalline form if the receiver be kept cool. Fused monardin may be cooled down below 70° without solidifying, but if the smallest crystal of the substance be dropped in it, crystallization commences, and is propagated throughout in a few minutes. The usual crystalline form of monardin is

the rhombohedron or some form derivable from it. By cooling a portion of fused monardin until crystallization is partially effected, and then pouring off the superstratum, it is obtained in very regular crystals. The sp. grav. of the amorphous variety is 1.03. When in crystals the enclosed air renders them lighter than water. It is neutral to test paper.

Monardin is soluble in a solution of caustic potassa, and by saturating the alkali with acetic acid it separates in the form of an oil, which, by standing, assumes the same crystalline form, and possesses the same odour as before subjection to the alkaline menstruum.

When crystals of monardin are placed in a solution of ammonia they gradually assume the form of oily globules, without dissolving in the ammoniacal liquid, and remain at the bottom. Whilst undergoing this change they have the appearance of fusing. The globules of monardin, after treating with ammonia, solidify when subjected to a temperature as low as 18° Fahr. By exposure to the air these globules gradually assume a purple colour, and when heated with caustic potassa no ammonia is evolved.

When crystallized monardin is introduced into a jar of ammoniacal gas over mercury, the ammonia is rapidly absorbed, and the crystals are liquified. When suffered to remain until saturated, they absorb nearly one hundred times their bulk of the gas, and are increased in bulk more than fifty per cent. When the liquified monardin is exposed to the air, it gradually assumes the crystalline form apparently unchanged. Oil of horsemint also absorbs ammonia, but not by any means in so great a quantity, or with any marked phenomena.

Monardin dissolves in cold concentrated sulphuric acid, to which it communicates a red tinge. The solution may be diluted and saturated with an alkali without the separation of any oily or crystalline matter, evidently proving that the monardin is changed.

Concentrated hydrochloric acid appears to have little, if

any, action on this substance, either cold or hot; when it is treated with cold, strong nitric acid, it is rapidly decomposed with the evolution of much deutoxide of nitrogen and the production of heat—after the action ceases, a thick yellowish brown mass remains, without any appearance of crystallization.

Having obtained a bottle of *ol. monardæ*, in which the monardin was in process of being deposited in crystals, the latter were separated from the super stratum of oil, and were found to possess the same properties as the other specimens previously examined. When this oil was subjected for some time to a temperature of 18° Fahr. a considerable quantity of similar crystals of monardin were deposited. The oil thus rid of most of the monardin was placed in an atmosphere of oxygen with the view of ascertaining if this principle was the result of the action of atmospheric oxygen upon it; but after forty-eight hours exposure, no evidence was obtained of the formation of that substance, although the experiment was not continued sufficiently long to settle the question.

The particular circumstances favorable to the formation of monardin, and its separation from oil of horsemint is as yet quite obscure. I have known this volatile oil to be kept for many years without any evidence of a deposit, while in another, and a recent instance, about a quart of the oil was taken from a large bottle in which no change had occurred, and in a few hours after, a crystalline deposition had taken place in the portion removed weighing several ounces. In all the instances where this deposit has taken place, the source of the oil was undoubted, having been obtained from the distillers in New Jersey. A careful, ultimate analysis of the oil, and of the deposit, would do much to throw light on this subject.

## ART. XXI.—NOTE ON TESTS FOR LEAD.

BY AMBROSE SMITH.

HAVING recently had occasion to examine acetate of potassa, which was contaminated with lead, and finding that the lead, although readily recognized by means of sulphuretted hydrogen, could not be detected by iodide of potassium, we were induced to make a few experiments, with a view of determining the relative delicacy of some of the tests for this metal.

*Iodide of potassium.*—We found that a solution of acetate of lead containing one part of acetate in 900 of water could be distinguished by iodide of potassium, striking a greenish yellow. When the solution contained one part in 1000, the iodide of lead entirely dissolved, forming a colourless solution. Iodide of lead is stated to dissolve in about 1200 parts of water, but we find it to be soluble to a somewhat greater extent when in the nascent state.

*Ferrocyanide of Potassium.*—One part of acet. lead in 10,000 water, formed on the addition of ferrocyan. potass. a white opalescent turbulence; one part in 15,000, a milkiness scarcely apparent.

*Sulphuretted hydrogen.*—One part acetate in 100,000 water, showed distinctly with sulphuretted hydrogen, the solution becoming brown; with one part in 120,000, a change was produced that could be recognized. A test tube  $\frac{1}{2}$  inch in diameter was employed in each experiment. Hence it appears that ferrocyanide of potassium as a test for lead is ten times, and sulphuretted hydrogen one hundred and twenty times more delicate than iodide of potassium.

The difference is still greater when the solution containing the lead, contains also a salt of potassa or soda. In a strong solution of acetate of potassa, containing 1-100th, of acetate of lead, no change was produced by iodide of potassium. When the solution contained 1-60th, it was

coloured yellow by the iodide of potassium; but on shaking the liquor, the iodide of lead entirely dissolved, forming a colourless solution. A similar effect occurred in solutions of acetate of soda, and tartrate of potassa containing lead, varying to some extent with their degree of concentration, and it is probable it occurs with most of the salts of these alkalis. When to the liquor containing the precipitated iodide of lead, sulphate of soda or carbonate of soda or potassa is added, the yellow colour disappears, leaving a white precipitate; the iodide of lead being replaced by sulphate or carbonate of lead. It is evident therefore that we cannot rely upon iodide of potassium as a test for the presence of lead in a salt of potassa or soda. We do not find that their presence effects the action of sulphuretted hydrogen if the proper precautions are observed, and so far as we have examined, this gas is the most delicate test for this metal.

From economical reasons the acetates of potassa and soda, are frequently made by mixing solutions of acetate of lead and carbonate of potassa or soda, carbonate of lead precipitating and acetate of the alkali remaining in solution; but this solution constantly retains a trace of lead, even if the alkaline salt be in excess. The lead may be entirely separated by passing sulphuretted hydrogen through the solution, until no further change is produced, and afterwards boiling it for some time in order to drive off the excess of the gas, and facilitate the precipitation of the sulphuret of lead. It will be necessary after boiling to add sufficient acetic acid to neutralize the solution if, as is generally the case, it has become alkaline.

## ART. XXII.—NOTE UPON SESQUINITRATE OF IRON.

By AUGUSTINE DUHAMEL.

A FORMULA for the preparation of this substance in solution is given in the last edition of the U. S. Dispensatory.

Prepared, as there indicated, it furnishes a transparent deep red solution. Agreeable to the recommendation of Mr. Kerr, by whom the formula is given, and with the view to prevent decomposition some hydrochloric acid is added, in quantity so small as not to affect its medicinal action, but sufficient, as he supposed, to preserve its character as a sesquinitrate of the sesquioxide of iron. This object, however, is not accomplished. Not only myself, but others have invariably found that, after a few weeks standing, the solution becomes wholly turbid and incapable of passing clear by filtration; the further action of time occasions a spontaneous deposit of a flocculent ochrey oxide, while the clear fluid stratum is changed to a light reddish yellow colour, and is less dense than the original solution.

In accounting for this change, the first question which presents itself is relative to the true constitution of the preparation. Is it a sesqui-nitrate of sesqui-oxide of iron in solution? According to Thenard, "always in treating iron by nitric acid, this metal passes to at least the state of oxidation represented thus:  $\text{Fe O} + \text{Fe}^2 \text{O}^3$ ." This formula is that of the black or magnetic oxide of iron, and the existence of the iron in this state is proven by adding ammonia, which throws down the black oxide in a hydrated form. Hence the change which occurs in the medicinal solution is owing to the peroxidation of the equivalent of protoxide of iron, and the consequent precipitation of at least a portion of it in the form of the ochrey sediment. The change may be thus explained:  $6(\text{Fe O}, \text{Fe}^2 \text{O}^3 + 4 \text{NO}^5) + \text{O}^3 = 8(\text{Fe}^2 \text{O}^3 + 3 \text{NO}^5) + (\text{Fe}^2 \text{O}^3)$ .

It follows from this, that every six equivalents of the

nitrate of the black oxide by absorbing three equivalents of oxygen, becomes converted into eight equivalents of the sesqui-nitrate of the sesqui-oxide, and one equivalent of sesqui-oxide, which precipitates.

From these facts it is evident that the name of this preparation is chemically incorrect, as it is the nitrate of the black oxide, and may be represented thus:  $\text{Fe O, Fe}^2 \text{O}^3 + 4 \text{NO}_3 + \text{aq.}$

Under these circumstances it becomes necessary to change the form of administration from that of solution to a syrup, to ensure permanency of character and effect. Such a preparation, Dr. Hays, of this city, tells me he has been using for several years. In making it I have pursued Mr. Kerr's formula, using, however, only half the quantity of water, and dissolving in this a little less than twice that proportion of sugar. The unnecessary hydrochloric acid I dispense with. Take of iron wire free from rust and cut in pieces 6 drs.

Nitric Acid	- - - - -	f. 1½ oz.
Water	- - - - -	f. 8 oz.
Sugar	- - - - -	14 oz.

Add to the iron the acid previously mixed with the water, and set aside the mixture for twelve hours, that the acid may be saturated. Decant the liquor from the undissolved iron, add the sugar which you dissolve in it by heat, and finally strain.

It has been found to keep in this form, and is doubtless improved as well in taste as in appearance.

Its properties are all tonic and astringent.

## ART. XXIII.—NOTE ON ADULTERATED OPIUM.

BY C. ELLIS.

THE determination which is manifested on the part of many of the respectable importers and dealers in drugs in this country, to prevent the introduction into our markets of spurious and adulterated articles, is highly creditable.

One of the leading objects of the American Journal of Pharmacy will thus be promoted; and the public be placed on their guard against a species of fraud, which, if it were less criminal in its nature and fraught with less injurious consequences to the health and even lives of our citizens, might be viewed with a modified degree of indignation.

The following is extracted from a letter from David Taylor of London, addressed to the house of N. Lenig & Co. of this city, and politely furnished by these gentlemen for publication; accompanied by a printed article taken from the Pharmaceutical Journal of London, by "T. N. R. Morson." The letter states : "We regret (that) we were unable to obtain a sample of the adulterated opium. The holders refused to let us have one, although they had promised it. Part of the parcel has, we believe, been shipped to New York and Boston. One of our morphine manufacturers has communicated the results of experiments upon the parcel referred to, which appears to be adulterated with wax and india rubber. We enclose the article extracted from the Pharmaceutical Journal, which will interest you."

## ON A NEW VARIETY OF OPIUM.

BY MR. T. N. R. MORSON.

THE importance attached to all matters relating to the complex chemical nature of opium, more especially such as

affect its narcotic powers, or render it in any way unfit for the use of the Pharmaceutical Chemist, will be sufficient excuse for my presenting to the Society, in an imperfect state, a few observations on what is to me a new form of this drug, and one which has recently excited some little attention among purchasers.

Several chests of opium have been lately imported from Turkey, having, both in the size and weight of the lumps, and general external appearance, a very close resemblance to that variety known as Constantinople opium, so justly celebrated for its strength and purity, and which yields the largest proportion of morphia. A close observer, however, would see in the opium in question sufficient difference to attract his attention, it being unusually soft, and of unusually light colour; but these differences are by no means evidences of impurity, and consequently the opium found ready purchasers. Having been requested to give an opinion respecting its strength, I proceeded to examine it in the usual manner, and soon found it to differ materially from any specimen I had previously examined.

It is exceedingly difficult with this opium to obtain a bright aqueous solution, for whether cold or hot water be employed, the solution filters, even through cloth, with great difficulty, and if much concentrated, will not filter at all without constant change of the filter, and consequent loss of product. My first impression was, that it was altogether spurious, but having separated from it morphia, co-dea, meconic acid, and other of the usual constituents of opium, and considering these in connexion with its light colour and herbaceous odour, it appeared probable, at least, that the observable difference might result from a different mode of collection, and therefore that it required a more careful examination.

Sixteen ounces of the opium, divided into small pieces and placed in a moderately heated stove until sufficiently dry to be reducible to coarse powder, lost three ounces in

weight : this, after pulverization, was boiled in successive portions of alcohol, until eight pounds of this fluid had been employed, and filtered while boiling hot. The first solution became, on cooling, nearly solid ; and even the last, although colourless, was sensibly turbid. These solutions filtered readily when perfectly cold, leaving a bulky gelatinous looking mass, equal in volume to the quantity of opium employed, but which by pressure was reduced to a small bulk, and when dry was in weight about one ounce, and consisted almost entirely of a substance resembling wax, combined with an elastic matter resembling caoutchouc.

The opium, after treatment with alcohol, was then boiled in pure sulphuric ether, until all matter soluble in that fluid was removed, and the evaporated ether left one ounce of the waxy substance in a pure state, which, with the other products, is on the table.

My next object being to ascertain the quantity of morphia, the filtered alcoholic solutions were distilled, and the matters remaining in the water-bath acted on with distilled water to separate the resinous matter insoluble in that fluid and in the natural acid of the opium. The aqueous solution, treated in the usual manner, gave one ounce of slightly colored morphia. It also contained other principles common to opium.

The unusually large quantity of wax and caoutchouc contained in this opium, and the diminished quantity of morphia, render it quite unfit for general use. A microscopic examination of the insoluble part, which, unlike many other Turkey opiums, is in a state of minute division, shows it to have been largely mixed with the capsule of the poppy ; and it is, therefore, probable that this opium is obtained by expression, instead of incision ; or at least is very largely mixed with the expressed matters so obtained, and the powdered external coat of the capsule.

## ART. XXIV.—ESSAY ON THE PURPLE FOXGLOVE (DIGITALIS PURPUREA.)

By M. HOMOLLE.

THE author commences this treatise, which obtained the prize offered by the Societe de Pharmacie, with a general account of the several memoirs hitherto published on this subject, and then describes some preliminary experiments, previously to arriving at the following process for eliminating the principle digitaline in a pure and crystalline state.

2 lbs. of the dried leaves of *Digitalis*, coarsely powdered and previously moistened, are conveyed into a displacement apparatus, and treated with water. The mixed liquors obtained are immediately precipitated with a slight excess of subacetate of lead, and thrown on a filter. They pass limpid and nearly free from colour, preserving all their bitterness, and presenting a slightly acid reaction. Some dissolved carbonate of soda is added until no further precipitate is formed. The liquid is filtered anew, and freed from lime which it still retains by oxalate of ammonia, and afterwards from salts of magnesia by ammoniacal phosphate of soda.

The filtered liquor presents an alkaline reaction, is clear, of a yellow brown tint, and excessively bitter; a slight excess of a solution of tannin is added to it, and the precipitate formed collected on a filter and dried between folds of blotting-paper, and then mixed whilst still moist with one-fifth of its weight of powdered oxide of lead. The soft paste which results is thrown on a filter to drain, pressed between blotting-paper, and finally dried in a warm chamber. It is then powdered and extracted with strong alcohol.

The alcoholic solution, sufficiently evaporated at a gentle heat leaves as residue, in the form of a yellowish granulous mass with a small quantity of supernatant mother-ley, the

bitter principle, still retaining some traces of oil, salts and extractive substances.

This mass is washed with a little distilled water, which removes any deliquescent salts, without perceptibly dissolving the bitter principle. It is left to drain, and again dissolved in boiling alcohol, with the addition of a sufficient quantity of charcoal, washed with hydrochloric acid; it is then boiled and thrown on a filter. The liquid passes colourless; left to spontaneous evaporation in a warm chamber, the substance is partly deposited on the sides of the dish in the form of thin, light, semi-transparent layers, and partly at the bottom of the vessel in the form of agglomerated whitish granular flakes.

The perfectly dried product is reduced to powder and treated with rectified æther. It is left 24 hours in contact, then boiled and filtered. This æthereal solution, on spontaneous evaporation, leaves a slight crystalline white layer, consisting of a certain proportion of the bitter principle, a trace of green oleo-resinous matter, a substance whose odour calls to mind that of *Digitalis*, and of a substance crystallized in beautiful white needles, without smell, of an acrid and rather sharp taste, insoluble in water and alcohol, fusible at about 302° Fahr., and upon cooling forming a yellow radiated crystalline mass. The small quantity we have been able to isolate has not permitted us to ascertain its other properties. We shall pursue the investigation of it as soon as we obtain a sufficient quantity.

An experiment made on 250 grs. of aqueous extract of digitalis, prepared with care, which was redissolved successively in alcohol and water, did not enable us to obtain the bitter principle solid and completely isolated. We thence concluded that the heat required for preparing the extract, altered this matter still combined with the bodies which accompany it in the plant.

Another experiment made on 2 qts. of juice of fresh digitalis, yielded a beautiful product; but the very small proportion seemed an objection to this method of preparation, indepen-

dent of the very great convenience of only being able to employ this process at a certain period of the year.

The fermentation which the presence of a small quantity of sugar in the plant caused in the liquors, however little the temperature was raised or the operation prolonged, the result of which was always the precipitation of a small proportion of altered bitter matter, induced us at first to add to the water with which the digitalis was exhausted one-tenth in volume of alcohol; we also hoped by this means to avoid the solution of a part of the salts of lime and magnesia. We have had to abandon this addition, which renders the process more expensive without affording better results. In general it is best to carry on each operation rapidly, and to avoid a temperature exceeding 50° or 54° Fahr.

We pass on to the study of physical and chemical properties of the principle which we have isolated; leaving it the name of digitaline, which former chemists have assigned to it by anticipation. Digitaline is white, colourless, difficult to crystallize, and assuming most frequently the form of porous warty masses or of small laminæ. It is so intensely bitter that the 15th part of a grain suffices to communicate a decided bitterness to 2 quarts of water. The taste of the solid digitaline is however slow in developing itself, owing to its sparing solubility in water.

It causes violent sneezing when it is powdered or agitated carelessly, even in small quantities.

Digitaline dissolved in water or alcohol is without action on red or blue litmus-paper; it is therefore a neutral substance.

A sample of this substance, purified with great care by alternate solutions and washings, without the use of charcoal, for fear of introducing foreign matters, was employed in ascertaining the following properties:—

Exposed in a tube to the action of heat of an oil-bath, it began at 356° to be slightly coloured; at 392° it had become brown; and towards 400° it began to soften to a sort of

paste, which swelled, appearing to acquire a lighter tint from the interposition of gaseous bubbles. The temperature having been carried by degrees to  $428^{\circ}$ , the substance diminished in volume, re-acquiring the brown tint which it had at  $392^{\circ}$ . When tasted after this experiment, it had lost a great part of its bitterness, and had acquired an acid, astringent taste.

Another portion, heated in the air on a slip of platina, became at first soft, then took fire and burnt briskly, but with a somewhat dull and smoky flame. No visible residue is left; but on moistening the spot with a little distilled water it becomes alkaline. The same phenomenon has been observed to a certain extent upon burning a small quantity of perfectly pure crystallized morphine. If the digitaline is not in a pure state, it burns, forming a very high porous mass, which disappears entirely if calcination be continued.

A portion burnt in a glass tube diffuses acid vapours. If it be heated with a fragment of potash, the vapours are alkaline; but as this occurred when experimenting for comparison on some pure salicine, we considered that it was due to a phenomenon similar to that described by MM. Faraday, Reiset and Gerhardt, and that the nitrogen here disengaged in the form of ammonia did not originate from the digitaline.

We were desirous of verifying the presence or absence of nitrogen by M. Lassaigne's process, and experimented comparatively on digitaline, salicine and morphine. In the first two cases we only obtained a faint greenish yellow tint, which we attributed to the persalt of iron, and with the morphine a slightly bluish emerald-green tint. Although these last results were not as decided as we had expected, for with morphine, a nitrogenous substance, we ought to have obtained a beautiful dark blue tint, yet as they were constantly the same in several experiments, we regarded them as confirmatory of our first conclusion, viz. that digitaline is not a nitrogenous compound.

Cold water dissolves a little more than 1-200th, boiling water about 1-500th; no opacity results on cooling. During

the evaporation of the two solutions a part of the matter separated in the form of white flakes, and on the sides of the vessel some yellowish stripes formed, probably arising from an incipient decomposition of the digitaline by the heat employed for the evaporation. The best solvent for digitaline is alcohol. It takes up a large portion in the cold, and still more when heat is applied. The boiling solution, however, does not form any deposit on cooling. When digitaline has been purified by æther, it appears to dissolve with rather less facility in alcohol. The alcoholic solution, left to spontaneous evaporation, deposits the digitaline partly in a pulverulent, partly in a crystalline state. Towards the end of the evaporation the liquid often forms a kind of hydrated mass, which, after entire desiccation, takes the form of warty crusts. Concentrated æther dissolves so much the less of this bitter principle, the lower its density.

*Action of Acids.*—We have not been able to form any combination of digitaline with acids. This result was probable from the neutrality of this principle.

Digitaline becomes black directly it is placed in contact with concentrated sulphuric acid, and soon forms a solution which appears blackish-brown, when examined in a thin layer; after some time this colour passes successively into reddish brown, smoky amethyst, pure amethyst, and finally to a beautiful crimson. If during this interval a portion of the solution is added to a small quantity of water, a clear beautiful green solution results. Concentrated hydrochloric acid quickly dissolves it, communicating to the liquid a yellow tint, which after a few instants changes to a beautiful emerald green, and becomes darker and darker until it is of a dark green. In about an hour's time the liquor becomes turbid, and the matter at first dissolved is precipitated in the form of green flakes floating in a greenish yellow liquid. In the course of two days the flakes have become of a blackish green colour.

Digitaline does not dissolve in phosphoric acid, but merely acquires a slightly greenish tint after two or three days.

In pure concentrated nitric acid digitaline readily dissolves, with disengagement of reddish vapours, and forming a beautiful orange-yellow solution. The following days the solution changes to a golden yellow colour, and so remains.

In all the above reactions the digitaline is more or less immediately destroyed.

Acetic acid dissolves digitaline without colouring or changing it, at least as quickly as the concentrated mineral acids.

*Action of Potash.*—A little potash added to an aqueous solution of digitaline causes the bitter flavour to disappear slowly; but if the mixture be evaporated to dryness, the bitter taste gives place to an astringent one.

The singular property which alkalies possess of destroying the bitter taste of certain bodies had already been noticed by M. Bouchardat, with respect to synisine and lactacine; but we should add, that digitaline, submitted to the action of liquid ammonia for more than 10 days, did not appear to undergo any alteration.

We have not found any salt which was precipitated by an aqueous solution of digitaline. A solution of tannin renders the liquor opaque white in mass, and opal only if a drop be examined; the precipitate does not begin to form till after 24 hours.

Amongst the different properties of digitaline which we have passed in review, there is one which seems especially characteristic, and which belongs as far as we are aware, to no other substance; it is that of forming a beautiful emerald green solution with concentrated hydrochloric acid. This reaction is the more valuable, as a particle of this substance placed in a tube with 2 or 3 drops of hydrochloric acid is sufficient to develope the green colour after a few instants; and we think that this character ought to form the proper criterion for discovering digitaline in medico-legal or analytical re-

searches ; afterwards will come the action of sulphuric acid and that of acetic acid.

The conversion of digitaline into an acid astringent principle, on the one hand by the influence of heat, and on the other by potash, joined to the slight alteration which we observed during the evaporation of the aqueous solution, indicate in a practical point of view, that the employment of heat must be very unfavourable in making the pharmaceutical preparations which have digitalis for basis, and that care must be taken not to add alkaline salts to them.

We have seen that pure digitaline is scarcely soluble in water ; we must not, however, conclude from this that this agent is unfit to dissolve the active principle of the plant. In the *Digitalis* it occurs in combination with saline and extractive matters, which favour its solubility in this medium.

Digitaline which has not been purified by æther retains, as above stated, a green matter, an odiferous substance and a crystallizable principle, and is known by its peculiar odour, calling to mind that of *Digitalis*. It dissolves but imperfectly in hydrochloric acid, so that the liquor remains turbid, but presents the same intense green colour. It moreover leaves some light flakes on solution in acetic acid.

The author has not submitted the digitaline to elementary analysis, not having been able to obtain it perfectly pure in sufficient quantity, the amount in the plant being extremely minute.—*Chem. Gaz.*

**ART. XXV.—PHYSIOLOGICAL AND THERAPEUTICAL ACTION OF THE BITTER PRINCIPLE OF DIGITALIS.**

M. HOMOLLE exhibited the bitter principle to a rabbit, introducing 5 centigrms. into the cellular tissue of the thigh; it produced anxiety, trembling, and reduction of the pulse from 148 to 124; 10 centigrms. reduced it from 108 to 102, it subsequently rose to 144. 15, 20 and 30 centigrms. were afterwards given, and reduced the action of the heart 24 to 30 beats. During these experiments there was no vomiting; the state of the urine could not be satisfactorily ascertained. It was found that a fifth part of the quantity, which when taken into the stomach acted as a poison, produced the same effect when inserted beneath the skin. 5 centigrms. given to a dog had no effect upon the pulse, but produced vomiting. A similar dose, repeated also, produced vomiting, a bloody stool, and increase of the pulse from 148 to 154. 5 centigrms. inserted beneath the skin caused staggering, hiccup and trembling, and raised the pulse to 184, the action of the heart becoming irregular and tumultuous. 1 centigrm. applied to a blistered surface on the author's arm, in one instance reduced the frequency of the pulse, in another increased it, with occasional intermission, producing headache, dimness of sight and lassitude; the urine was diminished in quantity. 2 centigrms. produced analogous effects.

The author remarks that 1 centigrm., endermically applied, is sufficient to produce all the poisonous effects, as headache, dimness of sight, general debility, shivering, diminished urinary secretion, irregularity and intermittence of the pulse, without alteration in its frequency. 5 milligrms. taken internally produced very similar symptoms, slight diminution of the frequency of the pulse, debility and dimness of sight, normal quantity of urine, sometimes vomiting, increased frequency of pulse on assuming the erect posture; after the exhibition of

the medicine was withheld the quantity of urine was much increased.

In a severe case of pleurisy and pericarditis complicated with anasarca, deficiency of urine, which was bloody, orthopnea, tumultuous action of the heart, with a pulse which could not be counted, digitaline in the dose of 2 milms. repeated three times, was followed by the evacuation of 3 pints of limpid urine, and the pulse was reduced to 120 and regular. Four pills of 4 milligrms. were given during the next day, the urine continued abundant, the pulse was 96, occasionally intermittent; by the continuance of the medicine the pulse was finally reduced to 54, with occasional interruptions; the patient was afterwards completely cured. In the case of simple pleuritic effusion, digitaline appeared to hasten the absorption of the fluid. Its diuretic action was also well-marked in a case of nervous palpitation.

M. Solon not only has confirmed the experiments of the author, but even has found the digitaline more active than he did. He always observed that in a dose of 1 to 3 milligrms. in the day, its action on the circulation was marked, and reduced the pulse from 72 to 55 in the minute; the poisonous effects were always observed when the dose of the substance amounted to 1 centigrm. per diem. The diuretic action observed in some of the above experiments has not been confirmed. M. Solon concludes from his observations, that the dose of the digitaline should be from 1 milligrm. to 1 centigrm.\*

*Ibid.*

\* As the therapeutic actions of medicinal substances do not come within our limits, we have been obliged to curtail these experiments considerably.—ED. *Chem. Gaz.*

ART. XXVI.—EXPERIMENTS ON THE FORMATION OF  
LACTIC ACID FROM SUGAR-CANE.

By PROF. H. VON BLUCHER.

1. With a view of repeating the experiments of Pelouze and Gelis on the formation of butyric acid, the author added to a solution of 1800 grms. of cane-sugar in 9500 grms. of water some well washed caseine, and finely pulverized chalk, and exposed this mixture in an open glass vessel for 4½ weeks, in a drying chamber, at a temperature of from 86° to 94°, agitating it almost every day. In the course of 17 days some aggregated crystalline masses separated, which in the course of a few more days increased to such an extent, that being carried to the surface with the ascending bubbles of gas, they formed a compact crust, several inches in thickness, on the surface of the liquid. In 31 days the whole liquid had become converted into a thick crystalline paste. The water which had evaporated during this time had always been restored. The entire mass was now filtered through fine linen and well pressed, again dissolved in boiling water, and exposed in a cold place to crystallize; it yielded 1121 grms. crystallized lactate of lime, which, besides its water of crystallization, contained about 14 per cent. humidity. This large amount of lactate of lime was perfectly white after the first crystallization, and only acquired a slight brownish tint after long drying. On recrystallization the salt remained white, and was perfectly pure.

2. The author now made several experiments, in which the solutions were exposed to a temperature of 80° to 82°. They all underwent the same change, with apparently the same phenomena. 600 grms. cane-sugar, 2800 water, and 150 grms. moist caseine, yielded with a sufficient quantity of chalk, in the course of 4½ weeks, 469 grms. of well-

dried lactate of lime. The expressed liquid gives a residue of 82.1 grms., containing 16.91 grms. lime.

300 grms. sugar, 1400 grms. water, &c, gave under the same circumstances 213 grms. crystallized lactate of lime. The residue evaporated in the water-bath, weighed only 29 grms., in which were found 6.01 grms. lime.

These experiments prove, at all events, that 92 per cent. of the constituents of the sugar, which have not escaped in a gaseous state, have become converted into lactic acid, and probably, if we suppose the 6.01 grms. lime contained in the evaporated residue to be combined with 17.2 grms. lactic acid, even 99 per cent.

3. 1400 grms. cane sugar were dissolved in 6000 grms. water and 400 grms. moist (containing 94 grms. dry) caseine, and a sufficient quantity of finely-pulverized chalk mixed with it, and the whole exposed to a temperature of 77° to 86°. For the first 14 days the liquid remained perfectly clear with exception of the sediment, and retained a sweet taste; but soon the separation of crystalline lactate of lime took place with an apparently considerable evolution of gas, and in the course of 4 weeks the whole mass formed a crystalline paste, as in the previous experiments. After one re-crystallization 870 grms. crystallized lactate of lime were obtained; and the mother-ley, somewhat evaporated, yielded 162 grms. crystallized mannite. The latter however was not perfectly pure, and contained 3.6 per cent. lime, probably in combination with lactic acid. In the liquid separated by filtration and pressure from the mannite, there subsided, on evaporation over the water-bath, a further quantity of minute crystals of mannite, which however could not be isolated from the syrupy liquid, and the whole was therefore evaporated in the water-bath. The residue obtained in this manner weighed 732 grms., and contained 12 $\frac{1}{2}$  per cent. lime.

350 grms. of this dry residue were dissolved in 1200 grms. water, mixed with caseine and pulverized chalk, and pla-

ced in the warm chamber; in 7 days it had become converted into a crystalline paste, from which were obtained on recrystallization, &c. 210 grms. crystallized lactate of lime. The ley concentrated in the water-bath yielded a residue of 26 grms., in which were found 5·53 lime. If the product of 210 grms. be extended to the entire residue of 732 grms., this would have yielded 439 grms. of the salt; consequently the above 1400 grms. sugar would have produced 1309 grms. crystallized lactate of lime, and estimating the loss approximately at 3 per cent., 1348 grms. Notwithstanding the formation of mannite, therefore, more lactic acid was formed than in the experiments 1 and 2.

That the cane-sugar is not decomposed in the so-called lactic fermentation into mannite and lactic acid, appears to be placed beyond a doubt by the preceding experiments; perhaps however it is first converted into mannite, and this into lactic acid, which is not improbable, judging from the products of decomposition of the residue of 350 grms. To decide, if possible, this question, the author placed a portion of the mannite obtained, mixed with caseine, &c., in the drying-room; but not a trace of any formation of lactate of lime was perceptible after 8 days, nor could the author observe any sign of the formation of mannite in a solution of cane-sugar which had been mixed with caseine, &c., and exposed to a suitable temperature, after the course of 8 days on careful evaporation.—*Chem. Gaz., from Poggendorff's Annalen.*

## ART. XXVII.—METHOD OF ASCERTAINING THE QUALITY OF SOAPS.

To determine the quantity of water, thin slices are cut from the edges and the centre of the bars. A portion is then weighed, about 4 or 5 grms. (60 to 75 grs.,) and exposed in a current of air heated to 212° F., or in an oil-bath, until it ceases to lose weight. The dry substance is then weighed; the difference between the first and last weighing will indicate the quantity of water evaporated. If it be a soft soap, it is weighed in a counterpoised shallow capsule. In good soap the amount of water varies from 30 to 45 per cent., in mottled and soft soaps from 36 to 52 per cent.

The purity of soap may be ascertained by treating it with hot alcohol; if the soap be white and without admixture, the portion remaining undissolved is very minute, and a mottled soap of good quality does not leave, when operating on 5 grms., more than 5 centigrms., or about 1 per cent.

If there should be a sensible amount of residue from white soap, or more than 1 per cent. from mottled soap, some accidental or fraudulent admixture may be suspected, silica, alumina, gelatine, &c., the quantity and nature of which may be determined by analysis.

The quantity of alkali contained in the soap is easily determined by means of the alkalimeter.

10 grms. in thin slices are taken, for instance, and dissolved in 150 grms. of boiling water; and this solution is saturated with a normal liquor containing in a quart of water 100 grms. of sulphuric acid, spec. grav. 1.848, or with 1 atom of water.

The volume of this liquor required for complete saturation will indicate the corresponding weight of sulphuric acid, which is itself nearly equivalent to an equal weight of

## 110 METHOD OF ASCERTAINING THE QUALITY OF SOAPS.

dry carbonate of soda. The quantity of pure potash or soda may be thus deduced.

There is no difficulty in ascertaining in the same assay the quantity of the fatty substance. For this purpose 10 grms. of pure white wax free from water are added to the liquid after saturation with sulphuric acid, and the whole heated to complete liquefaction ; it is then allowed to cool, and when it has become solid, the cake of wax and fatty matter which have united is removed and washed, dried and weighed ; the augmentation in weight beyond the 10 grms. employed will give the weight of the fatty matter.

The liquid decanted from the solidified wax may afterwards be tested to ascertain the purity of the base.

The solution of the sulphate may also be evaporated, and by an examination of its crystalline form, or by means of chloride of platinum, it may be ascertained whether the base be soda or potash, or a mixture of the two.

As to the nature of the fatty substance it is ascertained, with more or less certainty, by saturating the solution of the soap with tartaric acid, collecting the fat acids, and taking their point of fusion. It is possible, at least, by this to prove the identity or the absence of identity with the sample in the soap supplied, for instance whether it is made from oil or tallow, &c. The odour developed by the fatty acids, at the moment of the decomposition of the soap by acids, assisted by heat, will often indicate the nature of the fatty substance employed in its fabrication, or that at least of which the odour may prevail.

The soap is proved to contain an excess of fatty matter not saponified, by separating the fatty acids by means of hydrochloric acid, washing with hot distilled water, then combining them with baryta, and thoroughly washing the new compound with boiling water. The non-saponified fatty matter is easily separated from the barytic soap, by treating the mass with boiling alcohol, which dissolves the fatty substance. We can moreover assure ourselves that it has no

acid reaction on moistened litmus-paper, that it is fusible, and that it possesses the general characters of a neutral fatty substance.—*Ibid, from Chimie appliquée aux Arts.*

#### ART. XXVIII.—ON THE MANUFACTURE OF BORAX.

By M. KOEHNKE.

THE author gives the following directions for the carrying out of his process :

In the preparation of borax from crude crystallized carbonate of soda and crude Tuscan boracic acid, a solution of caustic soda is prepared, amounting to about 170 lbs. of 1·090 to 1·095 spec. grav., which requires on an average 50 lbs. of soda and 30 lbs. of good caustic lime, the latter mixed to a paste with 4 times its weight of water. When the mixture has been boiled in an iron pan, and converted into caustic ley, it is carefully covered, and after the lapse of a few hours the clear ley drawn off by means of a siphon, the residue again treated with a further quantity of water, well agitated, and the clear liquid again drawn off after a few hours' rest. A further quantity of water is poured over the residue, which is subsequently removed to be employed in washing the crystals of borax obtained.

The leys thus obtained are boiled down to 170 lbs. or to 1·090—1·095 spec. grav., and then 40 lbs. of good Tuscan boracic acid introduced, and further boiled until the ley is reduced to 120 to 125 lbs., or indicates 1·175—1·180 spec. grav.; upon this the liquid is poured boiling hot into a wooden tub which is well surrounded with woolen cloths and straw, and carefully covered to retain the heat as long as possible, so that a good and regular crystallization may be effected.

When borax crystallizes from a warm solution at from

95° to 105°, octahedral crystals are obtained, which contain only 5 atoms of water of crystallization, and consequently entail a very considerable loss in product. This is not to be feared in the above process, but great attention should be paid to the specific gravity of the ley; for if the hot ley, placed aside to crystallize, has been reduced by boiling to beyond 1·180, octahedral crystals are likewise obtained. It should moreover be observed, that the boracic acid, which has been introduced according to the above directions for the first time, is by no means sufficient to convert the whole of the soda into borate, but an excess of soda has a very beneficial influence on the crystallization. It is moreover advantageous not to remove the dissolved lime from the caustic ley, but rather to add a little free caustic lime, as this serves partially to destroy the sulphates contained in the crude boracic acid. After three days the first crystallization is complete. The crystals are collected and broken, washed with the above mentioned dilute caustic ley, and placed aside; the borax ley, on the contrary is mixed with the wash liquors and placed aside, in order that it may deposit the sulphate of lime formed and any other impurities. As soon as the ley has become clear, it is carefully drawn off, boiled down, and during this operation 8 lbs. more boracic acid gradually added to it, and it is then treated as above. The ley which is now left still requires from 2 to 5 lbs. boracic acid; what remains after this third crystallization may be saturated with sulphuric acid, and obtained as sulphate of soda.

The re-crystallization of all the crystals obtained must generally be repeated twice, for which purpose they are dissolved in 24 parts rain water, the ley brought by boiling to the above-mentioned specific gravity, and conveyed boiling hot into a wooden vessel protected from rapid cooling.

The evaporation of the residuous ley is repeated. The crystallization is always terminated within two or three days. There is no need of filtration except on the last re-crystallization. The product amounts, when good sub-

stances have been employed, and with careful treatment, to from 60 to 62 lbs. of pure crystallized borax.

The preparation of borax from crude soda and boracic acid is more advantageous, but at the same time more difficult ; for this purpose a solution of caustic soda is likewise made, amounting to 300 lbs., of 1·090—1·095 spec. grav., which requires about 100 lbs. good crude Alicant or Teneriffe soda and from 45 to 50 lbs. caustic lime ; the ley is prepared in the same manner, and from 45 to 48 lbs. of boracic acid added to it, upon which the ley is concentrated to about 180 to 185 lbs., or spec. grav. 1·175 to 1·180 ; in the mean time the froth is now and then removed, and finally the whole placed aside to crystallize. To the first mother-ley from 8 to 10 lbs. of boracic acid are added, and to the second residuous ley 2 or 3 lbs. more, frequently however, according to the substances employed, even as much as 10 lbs., which must be determined by a previous examination of the borax ley. The mode of operation is precisely the same as described in the preceding method ; a greater quantity of sulphate of soda is however obtained on saturating the last mother-ley with sulphuric acid ; the produce in crystallized borax amounts to from 80 to 90 lbs.

The third method relates to the preparation of the biborate of soda from the half-refined East Indian borax, which contains considerable quantities of smearable or fatty ingredients ; it is washed with a caustic soda-ley of 1·370 to 1·380 spec. grav., and then, since it always contains a large excess of soda, it is gradually saturated with Tuscan boracic acid, as described in the previous methods, and purified by 3 to 4 recrystallizations. The produce may amount to 65, and in a favourable case to 75 per cent. crystallized borax.—*Ibid.*, from *Archiv. der Pharm.*

## ART. XXIX.—ON A NEW TEST FOR BILE AND SUGAR.

BY DR. M. PETTENKOFER.

THE phenomena about to be described, and of which an abstract was given in a former number of this Journal (vol. ii. p. 468,) were discovered by the author in studying the products of decomposition of the bile; the accuracy of this test depending upon several collateral circumstances relating to the purity of the reagents and use of proper proportions, we have deemed it necessary to notice these at greater length.

The author remarked that when ox-gall had been treated with sugar, and concentrated sulphuric acid was added until the precipitated choleic acid had begun to redissolve, the mixture became considerably heated, and the liquid assumed a deep violet tint, similar to that of hypermanganate of potash. It was at first considered that this remarkable alteration might depend upon the decomposition of the biliary colouring matter; but it was found equally to occur, nay even more evidently, with the bile which had been decolorized, and with pure biline obtained by Berzelius's method. All the attempts to separate the new product in an isolated state have hitherto completely failed. The author consequently confines his observations to the application of this phenomenon as a test (*a*) for bile (choleic acid,) and (*b*) for sugar. The following is the method of proceeding: A small quantity of the liquid supposed to contain the bile (if the substance be solid it must be treated with alcohol, and the solution evaporated) is poured into a test-tube, and two-thirds of the volume of sulphuric acid added by drops. The heat of the mixture must be kept below 144° Fahr., otherwise the choleic acid will be decomposed. From 2 to 5 drops of a solution of 1 part of cane-sugar to 4-5 of

water are now added and the mixture shaken. If choleic acid be present, the violet-red colour will appear more or less distinctly according to the quantity present. The following precautions are however requisite to be attended to : 1st, the temperature must not exceed that mentioned to any extent, otherwise the colour, although formed, will be again destroyed ; 2nd, the quantity of sugar must not be too large, because the colour of the sulphuric solution will become dark brown, and sulphurous acid will be formed whereby the violet-red colour may be concealed or destroyed ; 3rd, the sulphuric acid must be free from sulphurous acid ; 4th, if the fluid contain albumen, it is best to coagulate this previously, since albuminous solutions, although only when very concentrated and when heated with sugar and sulphuric acid, produce a similar colour. It could not be produced with mucous, nor with dilute albuminous solutions, which were always altered to a brown colour ; 5th a great excess of chlorides, although such is rarely found in animal bodies, converted the colour to a brownish red ; 6th, if the bile be in very small quantity, the fluid should be carefully concentrated on the water-bath, extracted with alcohol, this also evaporated to a small volume, and the test applied to the cold solution. Sometimes an interval of several minutes is required for the production of the colour, especially when the sulphuric acid is added very slowly, and consequently a lower temperature is generated. In liquids, where the bile is in very small quantity, as in urine, secretions, &c., the author has found it requisite to make a spirituous extract, to evaporate this nearly to dryness on the water-bath, and then to transfer the moist residue into a watch-glass. When quite cold, sulphuric acid and a very small quantity of syrup are added, so that the temperature of the solution remains low. In the course of a few minutes, if the most minute trace of bile is present, the colour is produced. In this reaction, the grape-sugar starch, or in fact any substance which is convertible into grape-sugar by sulphuric acid,

may be substituted for the cane-sugar. The same result was obtained with the bile of man, the fox, dog, ox, pig, fowl, frog and carp. The author concludes from this, that the bile of all the Vertebrata agrees chemically in containing choleic acid combined with soda.

By means of this test the author detected bile in the urine of a patient afflicted with pneumonia. The faeces of a healthy man, when extracted with spirit and treated as above, did not yield the slightest reaction, whilst on adding a little bile previously to the faeces it was perfectly developed. In the stools produced by calomel, several observers have remarked that the green or yellowish green colour is converted into red by treating them with mineral acids; by applying the sugar and acid, the same phenomena are produced. In all cases of diarrhoea, bile is found in the stools. The author imagines that the alterative effects of purgatives might be thus explained, by their carrying off the bile as fast as it is secreted, consequently preventing its absorption.

Concentrated muriatic acid heated with bile and sugar likewise produces a red colour, but this is much lighter and less beautiful than with sulphuric acid.

This test may also be adopted for the detection of sugar. If sugar be suspected in a liquid, urine for instance, an aqueous solution of ordinary ox-gall is gradually treated with sulphuric acid, until the precipitated choleic acid is again redissolved ; the suspected urine is then added, whereupon the violet-red colour is produced. As the quantity of sugar present is usually small, it is best previously to concentrate it. To detect bile in blood, the albumen is first separated by ebullition with spirit, and the concentrated fluid treated as above. If this test is used for sugar, the absence of starch must be previously proved by iodine.

The author thinks his test better than Trommer's in the examination of blood and urine, both because it acts more rapidly and delicately, and because its action is uninterrupted by the ammoniacal salts of the urine, the free am-

monia of which retains the proto and peroxides of copper in solution until it is completely expelled by boiling, whereby the reduction of the oxide of copper may be readily effected by other substances. Pure manna and gall, when treated as above described, afford no trace of the peculiar reaction. It is thus easy to detect grape-sugar in manna.

*Ibid, from Ann. der Chem. und Pharm.*

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#### ART. XXX.—ON PETTENKOFER'S NEW TEST FOR BILE.

BY DR. W. J. GRIFFITH.

THE test proposed by M. Pettenkofer is an exceedingly valuable one, and when applied in conjunction with that of the well-known reaction of acids on the colouring matter, will serve to supply what has hitherto been a desideratum, viz. a ready means of recognizing the peculiar biliary and the colouring matters in animal fluids. In a case of jaundice, which I had an opportunity of examining, the urine was of a golden-yellow colour, slightly albuminous, and not containing more than the ordinary proportion of other ingredients; on the addition of nitric acid, the green and red tints were well-marked, the former exceedingly intense; but on applying the sulphuric acid and syrup as recommended, and adopting the requisite precautions, not the slightest evidence of the presence of the choleic acid could be obtained, nor on analysis by the ordinary methods was I more successful; I therefore consider this a well-marked example (and I have since found another) wherein the biliary colouring matter only was separated with the urine. In examining a number of healthy urines, with a view to test the validity of this purple colour with the acid syrup, I was

occasionally much perplexed by finding on the addition of the acid alone, that the urine assumed a reddish-purple colour, closely resembling the characteristic one, and the subsequent addition of the syrup produced no alteration, thus rendering the test apparently inapplicable. This alteration arises from the action of the acid on the colouring matter of the urine, and may always be distinguished from the true test-colour by allowing the mixture to repose; the choleic purple is permanent, whilst the other is gradually changed to a brown colour. The experimenter will find that where the bile is in very small quantity, a considerable excess of acid will frequently detect it when a smaller quantity will not; the syrup, however, must be added in very small quantity.—*Ibid.*

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ART. XXXI.—ACETATE OF IRON AS A REMEDY FOR ARSENICAL PREPARATIONS.

THE hydrated peroxide of iron is of admitted efficacy in cases of poisoning with uncombined arsenious or arsenic acid; but according to the experiments of Duflos, it is quite ineffectual when these acids are combined with bases, as, for example, Fowler's solution, or arsenite of potash, or arseniate of potash, which last is frequently employed in calico-printing, and is consequently easily procured.

In the uncertainty in which the practitioner may be placed as to whether the arsenical poisons be free or combined, it is very important to administer the oxide of iron in such a form as to produce a favourable result; to this end it is convenient to employ the peracetate of iron.

This compound may be prepared by adding to the hy-

drated peroxide of iron obtained from the decomposition of four parts of liquid perchloride of iron, three parts of acetic acid of density 1.06, and sufficient water to make up 16 parts.

This liquid, which is a solution of peracetate of iron with excess of base, precipitates arsenious and arsenic acid from all their solutions, either free, or combined with any base; 500 grains of it are sufficient to decompose 1880 grains of Fowler's solution.

This result demonstrates that liquid peracetate of iron merits preference in cases of poisoning by arsenical compounds. It should be remembered that its power is more rapid in proportion as it is more diluted with water; besides which, large dilution prevents all irritating action of the acetic acid set free.—*Journ. de Ch. Med.*, November 1844, as inserted in the *Philosophical Magazine*.

[The mode of preparing the above compound is not very clearly stated, for the strength of the liquid perchloride of iron is not given. It may be presumed that peracetate of iron mixed with peroxide is to be employed; the degree of excess of the latter is of little consequence, and the strength of the peracetate is limited by the employment of four parts of acetic acid of 1.06 made up to 16 parts with water, and this, it appears, is to be largely diluted before exhibition.—*Ed. Phil. Mag.*] *Ibid.*

## ART. XXXII.—ON OFFICINAL SULPHUR PRÆCIPITATUM.

By DR. OTTO, of Brunswick.

THE officinal precipitated sulphur varies much in external appearance; sometimes it is of a pure yellowish-white, sometimes of a more or less dirty grayish or even brownish-white. It could not be accounted for why the former colour was peculiar to the preparation obtained from the sulphuret of calcium, and the latter to that prepared from the ordinary sulphuret of potassium. From some experiments which have been made in my laboratory, it has resulted that the dirty-coloured appearance of the latter preparation is owing to certain impurities, especially to an amount of sulphuret of copper. Ordinary potash (always or nearly so) contains copper; this passes into the purified potash, and from this into the sulphuret of potassium, which, on saturation with acids, deposits sulphuret of copper. Carbonate of potash prepared from tartar yields a yellowish white *sulphur præcipitatum*, like the sulphuret of calcium. A preparation thrown down from ordinary sulphuret of potassium retains its dirty colour even when fused with pure carbonate of potash, and again precipitated with acids, but the dirty colour disappears immediately on pouring chlorine water on it (in the dry state, for when recently precipitated it is converted by it entirely into sulphuric acid,) and the copper may be detected without difficulty in the solution, and likewise in the residue left on incineration. If some pure carbonate of potash, prepared from tartar, be fused with sulphur, with the addition of some oxide of copper, a sulphuret may be obtained, from which acids throw down a more or less brownish-white precipitate. Sulphuret of iron likewise appears to occur constantly in the preparation obtained from ordinary sulphuret of potassium. It appears therefore absolutely requisite that in future the sulphur præcipitatum be prepared solely from the sulphuret of calcium.—*Ibid, from Pharmaceut. Central Blatt.*

ART. XXXIII.—ON THE LIQUEFACTION AND SOLIDIFICATION  
OF GASEOUS BODIES. A Lecture delivered at the Royal Institu-  
tion, by PROFESSOR FARADAY.

BEFORE commencing his lecture, the Professor read an extract from a letter written by Professor Liebig, of Giessen, shortly after his visit to this country, in which the learned writer said, the thing which struck him most in England was the persuasion that only those works that had a practical tendency attracted attention and commanded respect, whilst those which were purely scientific were almost unknown; and yet the latter were the true sources from which the others flowed. In Germany, added Liebig, it was the contrary; but he did not say that that was better—in his opinion the golden medium was the proper course. Mr. Faraday then proceeded with his lecture. The condensation of gases (said he) had been brought before the public some years ago. A gas was one of those substances in an aërial form which remained permanent under the ordinary circumstances of temperature and pressure, whilst vapor was like gas, but which under ordinary circumstances was condensable again into liquid. It was at one time thought that all gases were perfectly elastic fluids, but by his researches he had succeeded in turning into vapor the following nine gases, namely, chlorine, muriatic acid, sulphurous acid, sulphuretted hydrogen, carbonic acid, euchlorine, nitrous oxide, cyanogen, and ammonia. One of these, namely, carbonic acid, the late celebrated Thillorier, of Paris, had, after many experiments, obtained in a solid state, and Bunsen had subsequently obtained also cyanogen in a similar condition. But although continued attempts had been made to solidify the other seven, and by immersion in deep water a pressure of 200 atmospheres, *i. e.*, of 3,000lbs. to a square inch, had been produced, still they had been unattended with success. He would explain what he believed to be the reason of the failure. If he took a bottle half filled with ether (and this was La-

tour's experiment), and applied to it heat, the ether would rise in vapor, and so would continue until the vapor was much condensed. At last, the liquor below and the vapor above would be of as nearly the same weight as possible, and the least degree of additional heat would turn the liquor into vapor, or, if taken away, convert the vapor into liquor. Observe what happened. At that temperature of ether no pressure could bring the ether into a liquid state; at a lower temperature it would. He believed, then, the reason why so many had failed in liquefying and solidifying gases was, that although they could procure the immense pressure he had mentioned, they could not obtain a degree of temperature sufficiently low. He would explain in what manner he had succeeded. He had taken as his basis carbonic acid gas in its solid state as produced by Thillorier. A quantity of carbonic acid, in partly a liquid and partly a vapor state, being confined in a tube, the expansion of the vapor forced the liquid through an orifice in the side into a cylindrical brass box, and being acted on by a rapid current of air the liquid carbonic acid was immediately converted into a solid substance like snow. Its temperature in that state was  $70^{\circ}$  below 0 of Fahrenheit; but though he took that as his basis, it was not low enough for the purpose of his experiments. The temperature must, therefore, be further decreased. It had been demonstrated by Thillorier, that if ether were applied to solid carbonic acid, the temperature could be reduced to even  $105^{\circ}$  below Fahrenheit; but a lower degree was still required, and that was obtained by exhausting the air. His object, then, was to combine this extreme degree of cold with great pressure in his experiments on gases. The means by which he effected it he thus described:—A quantity of gas in a glass vessel was forced by a condensing pump into a tube inserted in the receiver of an air pump; that part of the tube inserted in the receiver was made of common bottle glass (the strongest kind for experiments, and capable of bearing an enormous pressure) in the shape of a retort, and the bent or lower part of the tube lying immersed in the cold

bath (produced by solid carbonic acid combined with ether, after the air had been exhausted,) gas in a liquid, and by an increased degree of pressure, in a solid state, could be obtained. The learned professor illustrated the truth of the principle by producing olefiant gas in a liquid state, and observed that he had succeeded in obtaining in the same condition phosphoric hydrogen, by hydriodic acid, hydrobromic acid, fluoboron and fluosilicon; and in a solid form sulphurous acid, sulphuretted hydrogen, euchlorine, nitrous oxide, hydriodic acid, and hydrobromic acid. He had made carbonic acid the type of the others, but he thought that nitrous oxide would give a power of temperature as far below carbonic acid as that was below common ice. He saw no reason why the same result might not be obtained from oxygen, hydrogen, and nitrogen; and, in fact, he had hoped that evening to have shown oxygen in a liquefied state, but he had failed in his experiments, not because his principle was wrong, but from the porous, and hence imperfect, nature of the vessels used. With respect to hydrogen, he had had indications in the course of his experiments that it would be found to be a metal of a most subtle nature.—*Lond. Chemist.*

## ART. XXXIV.—ON THE PREPARATION OF CITRIC AND TAR-TARIC ACIDS.

BY THE EDITOR OF "THE DUBLIN HOSPITAL GAZETTE."

IN the preparation of citric and tartaric acids it is necessary to employ a precaution similar to that just described in the preparation of phosphate of soda. If cold lemon-juice be poured upon chalk, the carbonic acid liberated by the union of the citric acid with the lime, will not entirely escape, but will in part unite with a portion of the chalk, forming bicarbonate of lime, which will dissolve in the washings. Now, in this case, the inconvenience will result from the whole of the lime used not being present in the precipitate, for the quantity of dilute sulphuric acid used for the decomposition of the citrate of lime formed, is measured by the quantity of chalk employed. You are to use eight times the weight of dilute sulphuric acid, as of the carbonate of lime added to the lemon-juice, because it is calculated, that in this proportion there is just the amount of real acid necessary for saturating the earth. But if a part of the lime be carried off in the supernatant liquid, under the form of bicarbonate, it is evident that enough will not remain to neutralize the given quantity of sulphuric acid. So that when this acid has decomposed the citrate of lime, and freed the citric acid, the liquid which will dissolve the latter, will likewise contain a notable quantity of sulphuric acid, sufficient, upon evaporation, to char the crystals of citric acid, and render them discolored. It is necessary, therefore, for the success of this preparation, that the whole of the lime employed, should exist in the precipitate either as citrate, or carbonate, if an excess of the latter be used; to gain this end, all the carbonic acid liberated by the lemon-juice should be expelled, and to force its expulsion, the lemon-juice should be added to the chalk at a boiling temperature.

The necessity for the employment of a boiling heat is equal-

ly the case in the preparation of tartaric acid ; but the theory of its cause is so nearly identical that it is not necessary to describe it.

Mr. Phillips, junior, has shown (see the first number of this Journal,) that this tendency of carbonic acid to form soluble super-salts is commonly the occasion of a considerable loss in the preparation of the saccharated carbonate of iron.

I may be permitted, in conclusion, to notice, that it is this property of carbonic acid which most probably influenced the compilers of our pharmacopœias to direct the solutions of sulphate of magnesia and carbonate of potash to be mixed boiling, in the manufacture of carbonate of magnesia. The *magnesia alba*, or carbonate of magnesia of commerce, is a sub-carbonate, consisting of a combination of neutral carbonate of magnesia and hydrate of magnesia ; the neutral carbonate of magnesia is a crystallisable salt, which may be frequently observed depositing in the bottles containing solutions of the super-carbonate introduced by Sir James Murray, and so much employed in pharmacy at present. This neutral carbonate is decomposed when put into water ; if the water be cold, it is decomposed into *magnesia alba* and bicarbonate ; if the water be boiling, it is resolved wholly into *magnesia alba*, or the sub-carbonate, the excess of carbonic acid being expelled.

Now, precisely a similar series of changes occur when solutions of sulphate of magnesia and carbonate of potash are mixed together. These neutral salts yield by double decomposition the materials for producing neutral salts. But the neutral carbonate of magnesia is decomposed by the water, and it depends on the temperature whether the whole of the magnesia be precipitated as a sub-carbonate, or a portion of it be washed away in the form of soluble bicarbonate.—*Ibid, from the Dublin Hospital Gazette.*

ART. XXXV.—REPORT ON THE MEMOIRS OF MM. SIMON AND HARDY RELATIVE TO THE CULTURE AND PRODUCTS OF THE PAPAVER SOMNIFERUM IN THE CLIMATE OF ALGIERS.

BY MM. DE MIRBEL, BOUSSINGAULT, AND PAYEN (REPORTER.)

MM. DE MIRBEL, Boussingault, and myself have been charged with the duty of reporting on Memoirs by MM. Hardy and Simon, relative to the culture and products of the *papaver somniferum* in the climate of Algiers; we now submit to the Academy the result of our investigation.

M. Hardy, in a very detailed memoir, gives an account of his new efforts to fulfil the intentions of M. C. Marechal, Minister of War, and to solve the question of the utility of the production of opium in Algiers.

With this view, the director of the central nursery, in continuing his experiments, proposed to cultivate a greater extent of land, in order better to ascertain the influence of seasons, of the period of sowing the seed, of agricultural care, &c.; wishing, also, to keep an account of the expenses and to deduct them from the value of the crop, M. Hardy thought, and rightly, that it was necessary to determine the quality of the products.

This latter part of the operations was more particularly reserved for us; consequently, and in order to complete the basis of the calculations, we at once present our experiments and observations in this respect.

One of the samples of opium, collected by M. Hardy, had been extracted during the rain; we analysed it separately. 100 parts contained 89·1 of dry substance, and gave 4·67 of pure morphia. In taking account of the excess of moisture in this sample, in order to compare the amount of morphia with the products sent over last year, it was found that 92·4 of dried substance should have furnished 4·84, a number which does not nearly approach that of 5·02 found in the opium of 1844.

The other sample, which represented the quality of the greater part of the crop, extracted during more favorable weather, contained 9·5 of water per cent., and gave 4·94 of morphia; by reducing its proportion of water to 7·6, in order to establish the comparison between the product of 1843, it is found that it represents 5·10 of pure morphia per cent., that is to say rather more than the opium in the foregoing crop.

Thus the opium obtained this time in a more extended culture is evidently superior in quality to the products examined last year.

This result, therefore, appears to confirm the hopes which we had conceived relative to the possibility of obtaining in Algiers opium of good and uniform quality.

The second important product of the same crop consists in the oil which is easily extracted from the seeds after the opium has been collected.

Profiting by the assistance of M. Tripier, director of the Pharmacy of Algiers, M. Hardy proved that the poppy seed gave 45 per cent. of oil, the greater part of which flowed out without heat and is comestible.

The seeds which have been sent to us gave 42·6 of oil, that is to say, 2·4 per cent. less than the quantity obtained by M. Tripier. Probably, the difference observed was owing to some alteration during the voyage. The sample of oil received from Algiers is like the oil of cilette, and slightly more coloured than those of the north of France.

The more extended culture made last year permitted the verification and completion of the instructions communicated in 1843, by the care of M. Liataud.

The following is a summary of the favorable conditions deduced from the latest observations. It requires a soft light substantial soil, particularly well permeable to water.

If it retained the latter, the root of the poppy, which is large, fleshy, and soft, would very soon be destroyed. The soils which appear preferable are those in which sand pre-

dominates nearly in the proportions of two-thirds to one-third of clay. This land should be amended the year before by transient manures, and prepared during the summer by deep digging, so as to render the earth as light as garden land.

It is also very useful for the plantation to be sheltered as much as possible from the west winds; the slightly inclined declivities which face the east, seem to present the most favorable exposure.

The seeds should be sown in the autumn; they appear immediately after the first rains. They are covered with leaves by a slow vegetation during the winter; and, in the spring, they give stems and capsules of a strength not to be obtained by seeds sown during or after the winter, forced as they are by conditions of climate as soon as those sown four or five months earlier.

It may happen in a rainy spring, like that of this year, for example, that these late-sown seeds may give very fine products, but this case is of rare occurrence.

The land should be divided into beds of 2 metres broad, with paths of 40 or 50 centimetres left free from the operations of weeding, gathering, &c.; the length of the bed is immaterial. From 2 kil. 500 grs. to 3 kil., may be sown in each hectare of land.

Sowing in a line does not answer for so fine a seed, because it is difficult to bury it at a proper depth; there are almost always vacant parts, the seeds which are too deep in the ground not being able to spring up.

As soon as the young plants have four or five leaves they should be freed from weeds, and the superfluous plants removed so as to leave a distance of 0.20 to 0.25 centimetres between each. The most vigorous plants should be preserved. Afterwards, when necessary, the ground is dug up a second time, and care is taken that no other plant grow in the plantation. When the young poppies completely cover the ground with their foliage, the binette must not be intro-

duced any more, in order to avoid bruising the tender leaves. From this period until that of the maturity of the capsules, nothing is done to the plantation, except plucking up with the hand any weeds which may show themselves here and there, and of which the soil should always be carefully purged.

An important precaution to be taken during the operations of weeding, is not to wound the principal roots or the pivots, with the instruments made use of; otherwise the plant would perish by the decay produced by the effusion of its juices. The poppy will not bear transplanting; this means cannot therefore be employed for replenishing vacant places, as is the practice with some other cultures.

When it is perceived by their color turning yellow, and by the hardness produced by the accumulated juices, that the capsules have attained the proper maturity, the cultivator should hasten to put in requisition the workmen necessary for incising the capsules and collecting the opium; one hectare will require from 15 to 20 people for 12 or 15 days. Children should not be employed for this work; they cannot reach the capsules.

The product may be collected 20 hours after having incised the capsules, but this operation proceeds less quickly; by incising for three hours, the work of six or seven hours collecting is prepared. Thus the incising should be performed during the three hottest hours of the day, and the tears of opium which flowed out the night before collected during intervals of morning and evening.

The instrument which appears most suitable for making the incisions is a penknife with a convex blade; and, for collecting the opium, the blade of the carving-knife of the same form.

Taking account of the extraordinary and unfavorable variations of the temperature of this year, M. Hardy thus sets forth the culture of one hectare—

	Frances.
Labor with the hoe, 96 days at 2 francs,	- 192
Sowing, harrowing by hand, 44 days at 2 francs,	- 88
Twice digging,	- 118
Collecting opium, 229 days at 2 francs,	- 458
 Total for opium,	 - 856
Collecting seed, 37 days at 2 francs,	- 74
  	  930

## PROBABLE PRODUCT OF ONE HECTARE.

By supposing one-third more for the produce of opium (for it must be admitted that the season will not be always so unfavorable as this year,) M. Hardy arrived at the following results—

Opium, 13 kilogrammes, 268 at 30 francs,	- - 698
Poppy-seed, 11 hectolitres, at 30 francs,	- - 330
690 bundles of stalks, at 10 centimes,	- - 69
 Total produce per hectare,	 - 1097

Nett profit, - - - - - 167

We have received from the Minister of War two samples of opium obtained from another culture by M. Simon, by means of peculiar processes. This opium was contained in poppy heads cut in two.

No. 1 lost by desiccation 8·5 per cent., and gave 3·70 of pure morphia, representing 3·74 for the opium reduced to the proportion of water taken as a term of comparison.

No. 2 contained 6·45 of water; 3·86 of morphia was obtained, a quantity equivalent to 3·82, for the normal degree of humidity.

These results, verified by twice repeating the analysis, prove that the quality of the opium extracted by M. Simon is rather inferior to that of the samples from Algiers, collected in 1843 and 1844.

The smaller proportions of morphia might, indeed, be compensated, or more than that, by the greater quantities of opium collected; but not having received any intelli-

gence concerning the new processes employed, nor concerning the products obtained, we cannot form any opinion in this regard.

The examination of the memoir and sample sent by M. Hardy, and of which we have just given a report, shows that, notwithstanding exceptional and unfavorable circumstances of temperature, the quality of the opium is sustained and even improved; it is therefore permitted to us to hope that better results may yet be obtained in the ordinary conditions, by continuing with the same care these interesting agricultural experiments.

Everything leads us to believe that we may thus be able to obtain the important result of furnishing the medical art with an agent whose useful properties will be guaranteed by the uniformity of its composition.

The efforts to be made in order to obtain so high an object appear to us very worthy of being encouraged by the approbation of the Academy.—*London Chemist.*

#### ART. XXXVI.—ON THE HEAVY CALCINED MAGNESIA.

By M. J. DALPIAS.

For half a century, Messrs. Henry, of Manchester, have prepared a heavy calcined magnesia; the consumption of which is immense, notwithstanding its very high price.

For a long time, these gentlemen alone possessed the secret of manufacturing this kind of magnesia; but for several years, two or three other English manufacturers appeared to have discovered their process. Thus, the heavy calcined magnesia of Mr. Howard of London, is perfectly similar to that of Henry's; its density is the same, it is at

least five times higher than that of the ordinary calcined magnesia. Except Messrs. Henry, Howard, and two or three other manufacturers, there are, probably, very few persons in England who possess the secret of this preparation, and I think that M. Colas has rendered a true service to science by immediately making known the process which he has just discovered, and which consists in the following manipulation :—

A very firm paste is made by moistening powdered carbonate of magnesia. This paste should be well beaten, in order to employ as little water as possible; then it is dried in an oven, and it is calcined after having been pressed down in the crucible. It also contracts by calcination.

The crucible may also be filled with undried paste, and the whole put in the stove, in order to calcine it only after desiccation.

M. Colas has proved that it requires less time and heat to calcine magnesia, thus prepared, than for the calcination of ordinary magnesia. He has also proved that his heavy magnesia does not become hydrated, even after having been left for 24 hours in cold water. Those of Henry and Howard do not become more hydrated; it is likewise less soluble in the acids, and is much less apt to condense carbonic acid when exposed to the action of the air.

In 1811, M. Planché (*Bulletin de Pharmacie*, vol. iii., p. 511,) observed, that calcined magnesia might be obtained more or less dense, according as it is more or less strongly pressed before calcination; but, in order to obtain it very heavy, he recommends it to be kept maintained at a white heat for 6 or 8 hours.

More recently M. Durand published a process more similar to that of M. Colas.

This chemist expresses himself as follows—" Carbonate of magnesia is prepared with very pure sulphate of magnesia and carbonate of soda; before it is perfectly dry, it is strongly

pressed in a mould in order to give it compactness; it is afterwards heated to whiteness for at least 6 or 8 hours."

From the foregoing, it would appear that M. Durand would consider it necessary to employ a recently prepared and still hydrated carbonate of magnesia; this alone renders his process very little practicable; and the white heat for 6 or 8 hours renders it very expensive.

M. Colas's process is, on the contrary, so convenient, since it admits of a quantity of magnesia being calcined at one time and with less fuel, that it is to be regretted that his product cannot be recommended for medical use; ordinary calcined magnesia, notwithstanding the inconvenience of its lightness, should always be preferred to it, since it is much more soluble in the acids, and in equal weight is certainly more active.

Before presenting M. Colas's product to the *Société de Pharmacie*, I thought it my duty to repeat his experiments, which I found very accurate. I will here add some of mine, which, notwithstanding their little importance, may be placed after his, for they were made in consequence of them.

In the first place, I do not think that M. Colas's process is exactly the same as that pursued by the English manufacturers, for their heavy magnesia is so fine and soft to the touch that it might almost be taken for talc. This property is precisely the only one which M. Colas's magnesia does not possess in so high a degree. That which leads me to think thus is, that in these same manufactories, a heavy carbonate of magnesia is prepared, whose density is nearly equal to Henrys' magnesia, and that this calcined carbonate gives a product equally heavy, and very soft to the touch.

The preparation of this carbonate is also a secret.

I will conclude this note with a few words on the light calcined magnesia, which comes from London, and whose very moderate price is the cause of its being universally met with, and that many pharmaciens are wrong in not calcining their own magnesia.

M. Mialhe (*Journal de Pharmacie*, June, 1844) finds that  
12\*

"this kind of magnesia contains little or no carbonic acid." For my own part, I have never met with English calcined magnesia of commerce which did not contain carbonic acid; on the contrary, a very appreciable quantity of it is always found, and it always effervesces with sulphuric acid diluted to one-eighth. With respect to the water which it contains, his observations and those of M. Dubail are too correct for me to add anything to them. I will only say to M. Mialhe, that I do not think, with him, that ordinary calcined magnesia attracts carbonic acid only when it is hydrated; I think that it attracts water and carbonic acid at the same time, and it was with the view of proving my assertion that I made the following experiment :—

Light caustic magnesia\* was left for a month over mercury, and in an atmosphere of perfectly dried carbonic acid. Not the slightest absorption took place. I afterwards placed in the top of the bell-receiver a piece of ice wrapt in blotting-paper, in order that it might traverse the magnesia without wetting it. The carbonic acid was there gradually absorbed in so short a space of time, that, in this case, the magnesia could not have been hydrated before absorbing the gas. I think that the latter explains the presence of carbonic acid in the light calcined magnesia which comes to us from England; for, as M. Mialhe has wisely supposed, the English manufacturers are in the habit of exposing their calcined magnesia to the humid air, in order thus to obtain an increase of weight, varying between 15 and 20 per cent. I have several times repeated this experiment, and, contrary to the opinion of M. Mialhe, I have never succeeded in obtaining an hydroxide, but always a mixture of hydroxide and carbonate. An hydroxide with 1 atom of water may be directly obtained, provided that the magnesia be very caustic, and especially very light; if it possesses these two properties, it will be seen that, after having been wetted, by

\* I give this name to the magnesia which we prepare in our laboratories to distinguish it from English magnesia.

desiccation in an oven, it will gradually lose its weight until it contains only 30 per cent. of water; then calcination alone can make it lose more.—*Ibid from Journ. de Pharm.*

## ART. XXXVII.—ON THE CHEMICAL COMPOSITION OF GUANO.

Extract of a letter from M. E. MARCHAND, of Fécamp, to M. BOULAY.

BEING entrusted with the revision, for a local journal, of an article on guano, and on its value as a manure, I examined this curious product myself, and I found, by analysis, that it is composed of—

Hippurate	-	-	}	of ammonia.
Urate	-	-		
Phosphate	-	-		
Oxalate	-	-		
Hydro-chlorate	-			
Chloride of sodium.				
Carbonate (?)	-		}	of lime.
Oxalate	-	-		
Phosphate	-	-		
Ammoniaco-magnesian phosphate.				
Alumina, oxide of iron, and silica.				
Indeterminate organic matter.				

The existence of hippuric acid in this product is very remarkable; for, if guano be regarded, with M. Girardin, as coprolithes arising from antediluvian birds, or, with M. de Humboldt, as excrements and altered remains of birds which have inhabited, and still inhabit, the islands of the coast of Africa, it is no less true that the origin of hippuric acid, in this product, is difficult to be conceived, since none of the analyses of the excrements of birds which have hitherto been made and published have noticed this principle among its constituents.

Struck with these singular results, and supposing, besides, that hippuric acid might also be found in the excrements of birds with which we are more familiar, and that if skilful chemists have not met with it, it is probably owing to their not having looked for it, I am now undertaking a series of analyses of the *excrements of granivorous, piscivorous, and carnivorous birds*, being persuaded that investigations of this kind, properly directed, may give rise to physiological considerations and deductions of high importance.

When my experiments are completed, I will do myself the honor of communicating to you the results.—*Ibid from ibid.*

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ART. XXXVIII.—ADULTERATION OF IODIDE OF POTASSIUM WITH CARBONATE OF POTASSA. Extract of a letter from M. DESTOUCHES to M. BOUDET.

M. RIVAUD, a distinguished pharmacien of Saumur, wishing to notice the adulteration (by voluntary fraud or ignorance) of a chemical product sent to him from Paris, has requested me to examine it simultaneously with himself; he has sent me a bottle, bearing the seal and address of M. Paton, pharmacien at Batignolles, and labelled *Iodide of Potassium*.

This iodide is amorphous, and run into plates after the manner of *cautery stone*. It is of a milky white; the taste is pungent and alkaline. It quickly restores to blue powerfully reddened litmus paper: it effervesces with the feeble acids; it does not contain chloride; the alteration is due to carbonate of potassa.

In order to determine the intrinsic value of this product, it was compared with pure iodide of potassium, procured from the firm of Robiquet and Co.

5·0 of Robiquet's iodide (No. 1) were dissolved in 100 grammes of distilled water.

5·0 of the doubtful iodide (No. 2) were likewise dissolved in 100 grammes of distilled water. This solution was slightly opalescent.

Both solutions were heated by a solution of acetate of lead, until cessation of precipitate. To No. 2, dilute nitric acid was added to remove the carbonate of lead formed, and in order to put the two precipitates in the same condition, nitric acid was likewise added to No. 1.

Both precipitates of iodide of lead were well washed with cold distilled water, and thrown on filters, dried and weighed. The following was the result obtained :—

No. 1 gave 6·62. No. 2, 5·18.

Thus— $6\cdot62 : 5\cdot00 :: 5\cdot18 : 3\cdot91$ .

Or nearly 22 per cent. of carbonate of potassa, and only 78 of iodide of potassium, an enormous adulteration, and so much the more reprehensible as it is a medicine on which medical practitioners ought to be able to depend, and which is administered only in small doses.

The results obtained by M. Rivaud, by different means, are very nearly the same.

I beg you to be kind enough to insert this note in an early No. of the *Journal de Pharmacie*.—*Ibid from ibid.*

## ART. XXXIX.—CHEMICAL PHENOMENA OF DIGESTION.

BY MESSRS. BERNARD AND BARRISWILL.

IN a previous paper which we had the honor to submit to the judgment of the Academy, we experimentally proved that gastric juice is not limited merely to the dissolving of alimentary matters, but that it at the same time modifies them to an extreme degree, and thus prepares them for the ulterior phenomena of assimilation.

This first fact once established, we proposed to ourselves to study the special mode of action which gastric juice exercises upon the principal simple aliments. But before undertaking this study, it appeared to us indispensable to decide, definitely, upon the chemical constitution of the gastric juice, in the centre of which these transformations take place.

The constant acid reaction which gastric juice presents, constitutes one of its essential properties; it is known in fact, that gastric juice, neutralized by an alkali or an alkaline carbonate, loses entirely its digestive properties, which can always be restored by re-establishing its acid reaction. On another side we have acquired the certainty, that acidity is but one only of the elements of its activity—for, in exposing pure gastric juice to near the boiling temperature, it likewise loses its digestive properties, not from the absence of the acid re-action which remains the same, but by reason of your then acting upon another one of its principles which is essentially modified by heat.

After these two principal facts we admit, saving further demonstration, that gastric juice is indebted for the whole of its activity to the union of two principles inseparable in their action—viz. : 1st. A substance with an acid re-action.

2d. A peculiar organic matter destructible by heat. We merely give attention here to the cause of the acid re-action of the gastric juice. Two opinions in science prevail at the present day[regarding the cause of this acidity: the one admits this property to be owing to the presence of biphosphate of lime; the other attributes it to an acid in a free state, existing in gastric juice. The principal fact relied upon for denying the existence of a free acid in gastric juice, and admitting alone the presence of biphosphate of lime, consists in the circumstance that gastric juice acted upon by an excess of carbonate of lime does not disengage carbonic acid. Experience has shown to us that this is occasioned by the excessive dilution of the acid in the gastric juice, which allows the carbonic acid produced to be dissolved as fast as it is formed. It was simply necessary for us to concentrate the gastric juice in order to obtain with chalk an evident effervescence. Moreover, we have observed that gastric juice dissolves neutral phosphate of lime, and, we are assured that this salt is completely insoluble in the biphosphate of the same base. From these experiments we have concluded that the acidity of gastric juice is due, not to biphosphate of lime, but to the presence of a free acid.

The authors who have asserted the presence of an isolated acid in gastric juice differ in opinion upon its nature; while some admit it to be acetic, the majority consider it hydrochloric acid, others again phosphoric acid, and some lactic acid.

We have in succession sought to prove these different acids to exist in gastric juice. Before indicating the steps we pursued in these experiments, we will observe that they were made with very pure gastric juice taken from different healthy dogs.

*Acetic acid* being volatile, we submitted the gastric juice to distillation at a mild heat, with the necessary precaution to avoid the rude jumping and mechanical passing over of the liquid; the first products collected and tried with litmus

gave no acid reaction. As a counter-proof we distilled water, very faintly acidulated with vinegar: the first products of the distillation manifested an acid reaction. Gastric juice, to which we added a trace of acetic acid and even acetate of soda, behaved in the same manner by distillation. Having saturated gastric juice with carbonate of soda, then evaporated the solution to dryness and treated the residue with arsenious acid, we did not recognize the odour of oxide of cacodyle, which is, as is well known, so characteristic of acetic acid. From these experiments it seems to us proved that gastric juice does not contain any free acetic acid, neither does it any of the acetate.

Upon reflecting that the first products by distillation of gastric juice never give an acid liquid, we were tempted to avail ourselves of this fact, to reject also the presence of free hydrochloric acid, because according to the received notions, this acid which is volatile should have passed over in the first instance. We should, however, have committed an error, as will be seen by the following experiment: In fact, if you slightly acidulate water with hydrochloric acid and distill it, you will remark that nothing passes at first by distillation but pure water, whilst the acid which concentrates in the last products is only disengaged at the close of the operation. This unlooked for circumstance determined us upon distilling anew the pure gastric juice, and pushing the distillation to dryness. Here are the results: At first and nearly throughout the experiment, nothing passed but a limpid neutral liquid, affording no precipitate with nitrate of silver; afterwards nearly four-fifths of the juice having evaporated, a liquid sensibly acid is distilled, but furnishing no precipitate with the salts of silver. Lastly, near the termination, and when there remains but a few drops of gastric juice to evaporate, the liquid acid which is produced yields with salts of silver a precipitate so decided as not to be taken up by concentrated nitric acid. Beyond doubt this last product is hydrochloric acid, but it remains to be

determined whether it exists in the gastric juice, or if under the circumstances of the operation it is not produced by the decomposition of a chloride. When you add to gastric juice, which as is known contains lime, a *minimum* proportion of oxalic acid, it is rendered turbid by the formation of an insoluble oxalate of lime, whilst a like quantity of the same reagent occasions no turbidness in water containing 2000ths of hydrochloric acid, to which chloride of calcium has been added.

This single experiment evidently shows that the hydrochloric acid exists in the form of a chloride, and is not found in a free state in gastric juice. We shall have further occasion to confirm this fact by other experiments.

*Phosphoric acid* being a fixed acid, we were required to seek it in the gastric juice, likewise concentrated by distillation; the residue had acquired an extremely acid reaction, and effervesced with chalk, but never entirely lost its acid reaction, notwithstanding the excess of chalky carbonate. This property, joined to those given it by different authors, indicated in a positive manner the presence of phosphoric acid in gastric juice. We afterwards saturated the juice with lime and oxide of zinc: the filtered liquors were neutral, and presented to us all the characters common to lime and zinc. This experiment proves that the phosphoric is not the only free acid of gastric juice, for had it been so, by reason of the insolubility of the two phosphates we should not have found either lime or zinc in the filtered liquid. We satisfied ourselves that such foreign principles as chloride of sodium disguise nothing of the re-action. To determine now the nature of the acid, which, existing in gastric juice, could give rise to soluble salts of lime and zinc, we should bear in mind that it is an acid passing only with the last products of distillation, and does not precipitate salts of silver.

*Lactic acid* exhibited to us similar characters; we submitted to distillation water acidulated with lactic acid, and

discovered in this operation a striking analogy with the phenomena produced by the distillation of the gastric juice, namely—that in the first parts of the distillation, only pure water passes, but that towards the end an acid liquor, and that there remains a liquid residue strongly acid and effervescing with the carbonates. In distilling water acidulated with lactic acid, to which was added a small quantity of chloride of sodium, we obtained a still greater analogy, that is to say, we saw three distinct periods exhibited in the distillation, absolutely like that of the gastric juice: in the first, only pure water distilled over afterwards, an acid not precipitating salts of silver; and the last drops carried with them hydrochloric acid. This experiment nicely explains the presence of hydrochloric acid in the ulterior products of the distillation of gastric juice; this acid, in fact, proceeds from the decomposition of the chlorides by the lactic acid in the concentrated liquors. If this fact is not sufficient to prove that gastric juice contains no free hydrochloric acid, the following experiment will clear up all doubts in this respect—

If starch be boiled with hydrochloric acid, it soon loses its property of turning blue with iodine, whilst with lactic acid it undergoes no alteration even after prolonged boiling. On another side, if you boil starch with hydrochloric acid to which has been added a lactate soluble in excess, it will be observed that the fecula remains unchanged, as though lactic acid alone was the subject of the operation. This experiment plainly proves that hydrochloric acid cannot exist in presence of a lactic in excess. By similar evidence it may be proved that the existence of hydrochloric acid is inadmissible in the presence of a phosphate or an acetate in excess.

Taking up again these experiments, we see that lactic acid, and the acid of gastric juice, offer properties in common with each other: they are fixed by heat, carried along with the vapour of water in distillation, and disengage hydro-

chloric acid from the chlorides. Following up the comparison between the two acids, we have recognized in the acid of gastric juice all the characters pointed out by M. Pelouze for lactic acid; these two acids give in reality salts of lime, baryta, zinc, and copper soluble in water; a salt of copper which forms with lime a soluble double salt the colour of which is deeper than that of the simple; a salt of lime soluble in alcohol and precipitated from its alcoholic solution by ether. Upon the whole, from the characters enumerated, the existence of this acid appears to us, at present, incontestable. Mr. Chevreul and Messrs. Leuret and Lassaigne have already designated lactic acid in gastric juice.

*Conclusions.* From the preceding facts it may be asserted that the acid re-action of gastric juice is not owing to biphosphate of lime, but, on the contrary, results from an acid in a free state in the gastric fluid. We never could prove the existence of free hydrochloric and acetic acids as had been indicated. We have constantly found characters very distinct from lactic acid united to a feeble proportion of phosphoric acid.\* According to us lactic acid should be considered as a constant physiological production of organism. Whatever in fact be the conditions of alimentation in which we place the animals, we have never seen the acid principle of gastric juice differ in its nature. So that after an exclusive vegetable or animal diet kept up for several days, or even after a prolonged diet, we have always found free lactic acid.

In asserting that lactic acid is the constant cause of the acidity of gastric juice, we do not wish to create the belief that this acid by its nature is endowed with certain special properties which render it indispensable to the action of the phenomena of digestion. On the contrary, it results from

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\* The phosphoric acid we signalize here, should be looked upon as a secondary product of a re-action of lactic acid upon the phosphate contained in the gastric juice.

the experiments of Mr. Blondlot and those of our own, that if an acid re-action is indispensable to the manifestations of the dissolving property of gastric juice, the nature of the acid producing this re-action is indifferent.

It is thus we have been able to saturate gastric juice with neutral phosphate of lime, or add to it acetic or phosphoric acid in large excess, and even hydrochloric acid *in sufficient quantity to make it really in a free state*, in the liquid, and the gastric juice always preserved its digestive properties. This equivalence of the acids for the activity of the gastric juice appears even necessary : for at each instant, from the fact of alimentation, the most different salts are introduced into the stomach at the moment of the formation of gastric juice.

We are all made to understand, then, that if among these salts any be found of which the acid may be displaced by lactic acid, the digestive functions will be infallibly disturbed, if the new acid set at liberty could not replace the normal acid.—*Journal de Pharmacie.*

A. D.

ART. XL.—ON THE PREPARATION OF PHOSPHATE OF SODA.

BY THE EDITOR OF "THE DUBLIN HOSPITAL GAZETTE."

PHOSPHATE of soda is prepared, according to the directions of the "Dublin Pharmacopœia," by forming a soluble super-phosphate of lime by the action of sulphuric acid on bones burnt to whiteness, and decomposing this super-phosphate by means of carbonate of soda; the excess of phosphoric acid unites with the soda forming phosphate of soda which dissolves, while insoluble phosphate of lime is thrown down, and carbonic acid is given off with effervescence.

Now, I have observed, that when the solutions of super-phosphate of lime and carbonate of soda are mixed cold, and the mixture filtered for the purpose of separating the precipitated phosphate of lime, the liquid, when poured into a Wedgwood dish, and placed in a sand-bath, becomes turbid as it grows warm, and the effervescence at the same time becomes renewed; these phenomena continue until the solution attains a boiling temperature, so that it is necessary to refilter before crystallisation is permitted to take place.

The explanation of these facts is as follows:—when the excess of phosphoric acid decomposes the carbonate of soda, the carbonic acid liberated does not all escape, but some of it unites with a moiety of the lime, forming bi-carbonate of lime, liberating phosphoric acid which combines with the undecomposed phosphate of lime regenerating the super-salt. Now, both the bi-carbonate of lime, and super-phosphate of lime are soluble, so that when the solutions are mixed in the cold, the whole of the carbonic acid does not escape, nor does the whole of the phosphate of lime precipitate. A precisely similar reaction takes place when a stream of carbonic acid gas is passed through water holding phosphate of lime in suspension; the carbonic acid gradually

dissolves the phosphate of lime. When this solution is boiled, the carbonic acid is driven off, the lime it was combined with reunites to the excess of phosphoric acid in the super-salt, and insoluble phosphate of lime is again formed. This is the reason why the mixed and filtered solutions of super-phosphate of lime and carbonate of soda become turbid and effervesce upon the application of heat; phosphate of lime precipitating upon the escape of the carbonic acid which held it in solution.

To avoid the inconvenience, therefore, of being forced to refilter the liquid, it is necessary, in the preparation of phosphate of soda, to mix the solutions of super-phosphate of lime and carbonate of soda boiling, when the whole of the carbonic acid will escape, and the entire of the phosphate of lime will become precipitated.—*From the Dublin Hospital Gazette.*

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#### ART. XLI.—ON CEYLON MOSS.

BY M. SCHACHT, OF BERLIN.

FOR some time there has existed in commerce a lichen known under the name of Ceylon moss, which is employed in the same cases as carrageen.

This lichen is the *fucus lichenoides*, or *sphaerococcus*.

In order to ascertain the advantage to be derived from the employment of this moss for the preparation of a jelly, M. Schacht has made some experiments on the new plant, on carrageen, and on Iceland moss; and it results that, to obtain 100 grammes of jelly of the same consistence, it is necessary to employ 24 grammes of Iceland moss, 4 of carrageen, and 6 of Ceylon moss. The latter is less mucila-

ginous than carrageen, but it has the advantage over it of furnishing a less colored jelly.

A German physician, Dr. Liegmund, has maintained, that this moss does not contain iodine, but the presence of this principle in it is easily demonstrated. For this purpose, this moss is incinerated, the residue is treated several times by hot water, the united liquids are evaporated to dryness. The solid mass obtained with alcohol is agitated; and evaporated. The solid product is placed in a glass tube, a few drops of concentrated sulphuric acid are poured on, it is closed with a starched paper, heated, and the blue tint of iodine is very soon manifested.

By redissolving, in distilled water, the product of the evaporation of the alcoholic solution, and by precipitating it by nitrate of silver, the proportion of iodine may be determined.

In Ceylon moss, it is about 0 grammes 000·460; in carrageen, about 0 grammes 000·570; so that this last species contains more iodine than the former.—*Ibid from Journ. de Pharmacie.*

ART. XLII.—PROCEEDINGS OF THE NEW YORK  
COLLEGE OF PHARMACY.

AT a Stated Meeting of the College of Pharmacy of the City of New York, held June 19th, 1845,

Upon reading the Minutes of the Board of Trustees, the attention of the College was called to the correspondence between Mr. Wm. Bailey and the President: whereupon it was, on motion,

Resolved, That copies of the correspondence between Mr. Wm. Bailey, of Wolverhampton, and the President, relative to the Blue Pill Mass, together with a sketch of the mode of its analysis, furnished by Professor Reid, be forwarded to the publishers of the American Journal of Pharmacy, with permission to publish the same if they deem proper.

*Wolverhampton, 18th April, 1845.*

SIR,—I have the honor to acknowledge the receipt, per “Cambria” steamer, of a copy of a resolution of the College of Pharmacy of the City of New York, passed at its stated meeting, held on the 20th ult., relative to a specimen of Blue Mass handed to you by Mr. Aspinwall, stated to have been imported by Messrs. Cumming, Main & Co.—said to have been prepared by me, and supposed to contain 25 per cent. of mercury. I feel obliged, by your courtesy and justice, in apprising me of it. In reply, I beg to state for the information of your committee, firstly, that I never sold any to that house; and secondly, that I do not consider myself responsible for any Pharmaceutical Preparation, or Chemical, except those which bear my stamp, (one of which I enclose for your inspection;) and any article said to be mine, not having such stamp attached, you may consider fictitious and an imposition.

I also beg to inform you, that every preparation sent out from my Laboratory is invariably manufactured according to the formula of the London Pharmacopœia, and warranted as such, unless expressly ordered to the contrary. It may not be out of place to mention, that a valued friend of mine, who arrived in England from Philadelphia a few days ago, assured me, personally, that my Chemicals and Pharmaceuticals were more esteemed in your country than those of any other manufacturer.

If you think proper, I will, with pleasure, send to you direct, specimens of all or of any of the products of my Laboratory for your examination and report thereon. Waiting your instructions, believe me, with distinguished consideration, to remain

Yours, very respectfully,

W. BAILEY.

To Constantine Adamson, Esq.  
Pres'dt of College of Pharmacy, New York.

*New York, June 11th, 1845.*

SIR,—In reply to your favor of 18th April, I beg leave to say, that it arrived on the day after the stated meeting of the Board of Trustees in May, and consequently could not be submitted until Thursday of last week, the next stated meeting, when the following resolution was passed. "That the President be requested to communicate to Mess. Cumming, Main & Co. the contents of Mr. W. Bailey's letter, and then reply to him as he may judge proper." In conforming with this resolution, I waited upon the gentlemen above mentioned, and received from Mr. Cumming the assurance that the Blue Pill Mass in question did most certainly come from you, being purchased by their house in London, whose firm was Riach, Cumming & Co., and is now Riach, Main & Co.; and that the fact of it being intended for exportation to New York could scarcely, with any chance of probability, be unknown to you; moreover, that it was not ordered of any particular strength; that you

were written to, by their London house, inquiring at what price you could furnish a certain quantity of Blue Pill Mass; and that, in consequence of your offer, it was ordered from you, under the supposition that it was of the usual strength. As the College of Pharmacy considers itself in some measure the guardian of the public health, some further remarks appear to be requisite. It was the opinion of several members of the Board, that the apparent attempt to shelter yourself under the excuse that it did not bear your label or stamp, is but little in your favor; for although you proceed to say that everything bearing that distinction "is invariably manufactured according to the formula of the London Pharmacopoeia," you do not deny that you manufacture articles, "when expressly ordered," which may vary very much from that standard, and which may be sent abroad, as in the present instance, reckless on your part who may be imposed upon, or how much the recovery of a patient may be retarded, so long as you, by a slight reduction in price, succeed in obtaining an order from an exporting house, whose knowledge on such subjects must necessarily be very limited. We trust you will readily discover that, whatever may be the reports of your friends or agents doing business on this side of the Atlantic, your true interest will be best insured by never suffering an article to pass your gates, the quality of which (although it does not bear your label,) can be called in question; and we do not hesitate to add, that the preparation of chemicals of insufficient quality is no less beneath the dignity, than prejudicial to the interests of a manufacturer of reputation; and where the article is of such vital importance, as in the present case, it is not only reprehensible, but absolutely criminal.

Your labels, be assured, will be carefully preserved by the College of Pharmacy of New York; and the preparations which bear them, as well as such as you send here for sale, as the specimens your kindness may send the College for examination, shall be carefully tested, and their

respective qualities, without prejudice or favor, be made known; for already some bearing that warrantee have appeared in this market, which did not come up to the standard to which you lay claim—I allude to Oxyd of Zinc (which, in the hands of one of our members, exhibited a strong effervescence when submitted to the action of a diluted acid,) and Precipitated Chalk, whose decided saline taste at once disclosed the imperfection of its preparation.

We have hitherto been in the habit of sending to England, in confident expectation of invariably obtaining there the most perfect preparations; and we sincerely hope, that not only you, but every other chemical manufacturer in that country, will avoid affording us any inducements for repeating similar remarks. Having herein expressed to you the decided opinion of the Board of Trustees of the College of Pharmacy,

I remain, Sir,

Your obed't servant,

CONSTANTINE ADAMSON,

Presd't of the same.

To Mr. W. Bailey, Chemist,  
Wolverhampton, England.

*New York, March 20th, 1845.*

DEAR SIR,—The method of estimating the per centage of mercury, which I adopted in examining the sample lately for J. S. Aspinwall, Esq., was as follows:

Twenty-five grains were placed in a glass tube, being first mixed with about five grains of iron filings; the tube, which was green glass, was drawn out by heat to a narrow bore, and then bent in this form. This drawing represents the tube, with the blue pill mass in it, and the space it occupied in the tube. Heat was gently applied, and gradually increased by the flame of a spirit lamp, aided by a

BLUE MASS

blowpipe. The distilled mercury and results of the decomposition of the organic matters were passed into a small cup of alcohol; the tube was broken when cool, and all the volatilized matter mixed with the alcohol; this was diluted with about one ounce of water, and boiled with a solution of Proto-chloride of Tin in excess. The precipitate washed, and sublimed in a tube, gave the metallic mercury. The object of the iron is to decompose any sulphuret of mercury that might be formed. The alcohol decomposes, or rather holds in solution, the organic matter separated during the distillation, so that the mercury can subside. The proto-chloride of tin precipitates any mercury which might be dissolved by the formation of acetic acid during the destructive distillation of the organic matter.

Yours, very respectfully,

LAWRENCE REID,

To C. Adamson, Esq.,  
Chairman Com. of Inspection,  
Col. of Pharmacy, N. Y.

By order,

JOHN MEAKIM, Secretary.

## MISCELLANY.

*On a new Bleaching Principle produced by the slow Combustion of Ether in Atmospheric Air, and by the rapid Combustion of Bodies in a Jet of Hydrogen Gas.* By C. F. SCHÖNBEIN, Professor of Chemistry in the University of Basle, &c. Communicated in a letter to Michael Faraday, Esq., F. R. S., &c.—The author, having observed that a peculiar principle, in many respects similar to chlorine, was developed during the slow combustion of phosphorus in the atmosphere, was led to inquire into the product of the slow combustion of the vapour of æther mixed with atmospheric air. He finds that, besides well-known compounds, such as aldehydic, formic and acetic acids, there is evolved a principle hitherto unnoticed, which possesses oxidizing and bleaching properties in an eminent degree. It decomposes indigo, iodide of potassium, and hydriodic acid, and also, though more slowly, bromide of potassium. When in contact with water, it converts iodine into iodic acid, and sulphurous into sulphuric acid, changes the yellow ferro-cyanide of potassium into the red, and the white cyanide of iron into the blue; it transforms the salts of protoxide of iron into those of the peroxide; and it discharges the colours produced by sulphuret of lead. The author points out the similarity between the action of this substance, in these instances, and that of chlorine and of ozone.

Analogous results were obtained from the combustion of a jet of hydrogen gas in atmospheric air, and even, under particular circumstances, from the flame of a common candle, and also from various other inflammable bodies when burning under certain conditions. The author is hence led to the conclusion that this peculiar oxidizing and bleaching principle is produced in all cases of rapid combustion taking place in atmospheric air, and that its production is therefore independent of the nature of the substance which is burnt.—*Chem. Gaz.*

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*Observations on Euphorbia Esula and E. Cyparissias.*—M. Stickel draws attention to the fact, that the above widely distributed plants contain a considerable quantity of a yellow, very beautiful colouring substance, which may be precipitated from the decoction prepared with water containing alum, by basic acetate of lead or protochloride of tin. Ether extracts from these plants a tolerable quantity of caoutchouc;

alcohol then yields a tincture, from which, on long standing, a white, crystalline, highly volatile camphor-like substance, with a burning taste, is deposited. The liquid separated from this, yields, on evaporation, a dark green resin, which has a burning taste, gradually hardens by exposure to the air, and greatly resembles euphorbium; the author also found gallic acid.—*Ibid, from Archiv. der Pharm.*

*Notice respecting Veratrine.*—According to M. Versmann, the veratrine of commerce frequently contains lime, resulting from the employment of lime in its preparation. A small quantity of lime, moreover, facilitates the drying, and renders the preparation more beautiful. It is easily detected on incineration, and is best removed by dissolving the veratrine in spirit, precipitating with sulphuric acid, filtration, driving off the alcohol, and precipitating the veratrine with ammonia.—*Ibid, from Buchn. Rept.*

*Observations on Creosote.* By M. DEVILLE.—According to the author, the following rule may be applied to several of the resins, viz: that on their destructive distillation they yield the same oil (or at least one isomeric) as that from which they originated. The body formed on the distillation of guaiacum resin,  $C^{14} H^{16} O^4$ , called by the author hydruret of guaiacyl, resembles in every respect creosote ( $C^{14} H^{16} O^2$ ), and may be considered as its oxide. Creosote colours salts of iron blue, guaiacum oil colours them brown; both give with bromine crystalline compounds in which substitution occurs. Creosote may be regarded as the alcohol of the benzoyle series; both yield, when treated with sulphuric acid and chromate of potash, a peculiar salt of chrome; neither of them become coloured by exposure to the air if in the *pure* state. Creosote would therefore range in the class of essential oils which are regenerated by distillation; and this would explain why it is not obtained from all woods, and likewise why it appears to have a different composition according to its origin.—*Ibid, from Ann. der Chim. et der Phys.*

*An Account of the artificial formation of a Vegeto-alkali.* By GEORGE FOWNES, Esq.—The substance which is the subject of investigation in this paper, is a volatile oil, obtained by distillation from a mixture of bran, sulphuric acid and water, and is designated by the author by the name of *furfurol*. Its chemical composition is expressed by the formula  $C^{15} H^6 O^6$ , and its properties are the following:—When free from water and freshly rectified, it is nearly colourless; but after a few hours, it acquires a brownish tint, which eventually deepens almost to blackness. When in contact with water, or when not properly rendered

anhydrous, it is less subject to change, and merely assumes a yellow colour. Its odour resembles that of a mixture of bitter almond oil and oil of cassia, but has less fragrance. Its specific gravity at 60° Fahr., is 1.168; it boils at 323° Fahr., and distils at that temperature without alteration. It dissolves to a large extent in cold water, and also in alcohol. Its solution in concentrated sulphuric acid has a magnificent purple colour, and is decomposed by water. Nitric acid, with the aid of heat, attacks the oil with prodigious violence, evolving copious red fumes, and generating oxalic acid, which appears to be the only product. It dissolves in a solution of caustic potash, forming a deep brown liquid, from which ashes precipitate a resinous matter. With a slight heat, it explodes when acted upon by metallic potassium.

When placed in contact with 5 or 6 times its bulk of *Liquor ammoniae*, it is gradually converted into a solid, yellowish-white, and somewhat crystalline mass, which is very bulky, perfectly soluble in cold water, and easily obtained in a state of dryness under a vacuum. The formula expressing the chemical constitution of this substance, or of *furfuramide*, as the author calls it, is  $C^{15} H^6 N O^3$ , and it is classed by him with the *amides*. The oil itself appears to be identical with the substance described by Dr. Stenhouse under the name of *artificial oil of ants*. Another substance, isomeric with the amides, and of which the formula is  $C^{30} H^{12} N^2 O^6$ , was obtained by the author, and termed by him *furfurine*, and found to have the properties of a vege-to-alkali, and to form saline compounds with various acids.—*Ibid.*

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*On the Adulteration of the Sulphate of Quinine.* By M. PELLETIER.—The sulphate of quinine is easily adulterated with salicine, although it does not crystallize in the same form. When the sulphate of quinine is mixed with one-half or only one-fourth of salicine, the reaction of concentrated sulphuric acid is sufficiently decisive to enable one to conclude as to the sophistication; but if there be but one-tenth in the mixture, the sulphuric acid does not acquire the bright red colour which characterizes pure salicine; in this case the liquid resembles sulphuric acid coloured by some particles of carbonized vegetable matter. To be able to pronounce positively, it is therefore requisite to isolate the salicine, and to obtain the above reaction in all its force.

I added 12 decigrms. of concentrated sulphuric acid to 2 decigrms. of sulphate of quinine sophisticated with one-tenth of salicine; the salt was dissolved and coloured brown. I then added 25 grms. of distilled water, when the brown colour disappeared, and the salicine remained white and suspended in the liquid. The salicine is not dissolved by this acid solution of sulphate of quinine. I then filtered and collected

on a watch-glass a very bitter white powder, which gave the bright red reaction with cold concentrated sulphuric acid.

If from 50 to 60 grms. of water be added, the liquid remains opaque, apparently without any precipitate resulting; but after some time, one is observed to form with the gelatinous appearance of a precipitate of hydrate of alumina, which it is far more difficult to collect. It is consequently important to add the water in small portions, and to cease when it is seen that the precipitate separates with facility.—*Ibid, from Journ. Chim. Med.*

*On the Purification of Commercial Nitric Acid.* By M. C. BARRESWIL.—Commercial nitric acid almost always contains hydrochloric acid, which it is frequently important to separate. The usual method for effecting this, consists in adding a slight excess of nitrate of silver to the nitric acid, and distilling. However convenient this process may be, it is always employed with regret; for although the loss in silver is theoretically naught, it practically amounts to a pretty considerable quantity in a laboratory in which much pure acid is employed. For this reason I thought it might be useful to indicate a very simple method for obtaining pure nitric acid without the employment of nitrate of silver. It consists in distilling the commercial acid, and setting aside the first portions, amounting to from one-fourth to one-eighth, according to the quality of the acid employed. This first product is very impure, and may be turned into nitro-muriatic acid; that which passes over subsequently is absolutely pure.—*Ibid, from Journ. de Pharm.*

*On a means of detecting Quinic Acid.* By JOHN STENHOUSE, Ph. D.—As it is a point of considerable importance to be able to distinguish the true Cinchona barks from the spurious, Dr. Stenhouse offers, in the present communication, a means of effecting this through the medium of the quinic acid, which is always present in the genuine Cinchonas. The process proposed consists in converting the acid into quinone by means of sulphuric acid and peroxide of manganese, and submitting the mixture to distillation, when the quinone, with its strongly-marked characteristic properties, passes over. Less than  $\frac{1}{2}$  oz. of the sample of bark is sufficient for the trial. In operating on spurious barks, the alburnum of the *Pinus sylvestris*, the latter being stated, on the authority of Berzelius, to contain a  $\frac{1}{2}$  per cent. of quinate of lime, and also in cases when quinic acid is said to be associated with gallic acid,—the author could not trace its presence, even when operating on 1  $\frac{1}{2}$  lb. of the material, although on adding 2 grs. of quinate of lime, the quinone was immediately traceable. The author also states that the presence of an

alkaloid may be readily detected by macerating the bark in dilute sulphuric acid, treating the precipitate thrown down by carbonate of soda with caustic soda or potash, and distilling; quinoiline will pass over, which is easily recognised by its peculiar characters and properties. The exact nature of the alkaloid is to be subsequently ascertained.—*Ibid.*

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*Remarks upon Chloranil.* By Dr. AUGUSTUS WILLIAM HOFMANN, Assistant in the Giessen Laboratory.—Chloranil was first obtained by Erdmann, when studying the action of chlorine upon indigo. He represents it by the formula  $C^6 Cl^2 O^2$ . Laurent considers that its equivalent should be  $C^{12} Cl^4 O^4$ .

Erdmann obtained chloranil by passing a stream of chlorine through an alcoholic solution of chlorisatine or bichlorisatine; but this process is circuitous, and yields very little chloranil, other products resulting, and in larger quantity. Fritzsche formed chloranil by the continued action of chlorate of potash and hydrochloric acid upon aniline. Dr. Hofmann confirmed his statements, and observing the relation between the aniline and the phenyle series, endeavored to obtain chloranil from the latter group of bodies, and with success, chloranil being often formed as one of the last results of decomposition of organic substances under the united influence of chlorine and oxygen. By means of hydrochloric acid and chlorate of potash, Dr. Hofmann first obtained chloranil from hydrate of phenyle; and he found an aqueous solution, or a watery extract of coal-gas naphtha, which contains both aniline and hydrate of phenyle, preferable to a solution in alcohol.

To purify chloranil, it must be washed with water and crystallized from alcohol. Alcohol dissolves it when hot, and deposits it on cooling; it is more soluble in hot ether, but separates from either of these solvents in golden-yellow scales; volatile at  $302^{\circ}$  F., but subliming completely at  $410^{\circ}$  to  $428^{\circ}$  F. The identity of the substance obtained from the hydrate of phenyle with Erdmann's chloranil, was proved by the results of several analyses.

In the action of hydrochloric acid and chlorate of potash upon hydrate of phenyle, other substances are formed before chloranil. On interrupting the decomposition, and examining these bodies, they proved to be chlorophenussic and chlorophenissic acids. These acids are convertible into chloranil. Moreover, Laurent's nitrophenessic and nitrophenissic (carbazotic) acids are in the same way converted into chloranil.

Chrysolepinic acid of Schunck is also transformed into chloranil by the same agency; and it was found that several bodies in the salicyle

series, as salicylous acid, salicylic acid and nitrosalicylic acid (indigotic acid or anilic acid), under the influence of hydrochloric acid and chlorate of potash, decompose and yield chloranil.

Benzoic acid, although identical in composition with salicylous acid, does not yield chloranil; nor do nitrobenzoic acid, benzine, nitrobenzide, binitrobenzide or hydruret of benzyle.

Salicine (the basis of the salicyle series), being soluble in water, seems to be the fittest substance for yielding large quantities of chloranil. Salicine and chlorate of potash must be dissolved in boiling water, and small quantities of hydrochloric acid added at intervals; one of the results of the ensuing decomposition is chloranil.

In conclusion, Dr. Hofmann calls the attention of chemists to the chlorate of potash as an oxidizing agent applicable to organic chemistry; he has heated *quinone* with it and hydrochloric acid, and found it readily convertible into chloranil. Dr. Hofmann proposes to pursue the subject, and to trace the relations of quinone and aniline.—*Ibid.*

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*On some Specimens of the Green Glass of Commerce.* By ROBERT WARINGTON, Esq.—The principal subject of this communication was a green glass which has lately appeared as an article of commerce, in the form of wine bottles. These are offered to the consumer, the wine merchant, at a lower price, and with the tempting recommendation that they will cause port wine to deposit its crust sooner and firmer than the bottles usually employed. On examination, this property was found to arise from an excess of lime having been used in its manufacture, which had rendered the glass, to a certain extent, soluble in weak acids.—Dilute sulphuric acid acted to such an extent as to form a crystalline deposit of sulphate of lime in the interior, of a quarter of an inch in thickness, and this, in its crystallization, had burst the bottles in all directions.—*Ibid.*

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*Arseniate of Quinine.*—M. Bourieres, has lately made known a new salt, the arseniate of quinine, which he proposes to substitute for arsenious acid, the latter being threatened with final proscription, on account of the dangers which may result from its use. He obtained this salt directly by treating pure quinine with arsenic acid. This latter body being more soluble in water, and producing more neutral salts than arsenious acid, and which are better crystallized, he has given it the preference. M. Bourieres hopes that this new compound will possess the well-proved efficacy of arsenic in obstinate intermittent fevers, presenting the advantage of being exclusively reserved for medical use, which will prevent all danger. Without pretending that the small quantity of quinine which enters into combination in the arseniate of

this base performs a great part in the action of the medicine, he still does not think that its presence is entirely useless; and, in endeavoring to form with arsenic a new salt possessing febrifuge properties, he was naturally led to the employment of quinine.—*Lond. Chemist, from Journ. de Chim. Med.*

*On the distilled Waters of the Pharmacopœia.* By ROBERT WARINGTON, Esq.—This paper consists of an examination of the medicated waters of the Pharmacopœias of this country, prepared either by distillation or through the medium of carbonate of magnesia, and was commenced in consequence of a fact noticed by the author, that water containing a very small quantity of spirit became acid by long exposure to the air. On experiment it was found that many of the distilled waters underwent the same change, and evidently from the small quantity of spirit ordered to be introduced, as other portions of the same waters, to which no spirit had been added, did not in any case undergo this change. Many of the foreign Pharmacopœias also direct the simple distillation of the material with water without any spirit. In the instances where carbonate of magnesia is employed, the author proves that its action is only mechanical, to subdivide the oily particles, and thus expose a greatly extended surface to the solvent action of the water. It is also shown experimentally, that of all substances carbonate of magnesia is about the worst that can be employed; and this arises not from its forming soluble compounds with the oily acids, as is generally supposed, but from its being dissolved to an injurious extent in the distilled water employed: he therefore proposes the substitution of the Cornish porcelain clay, finely powdered silica, glass or pumice stone, as a medium for the mechanical subdivision of the essential oil.—*London Chem. Gaz.*

*On Musk in Emulsions.* By DR. HAULN, of Lahr.—We have found in one of the last numbers of the *Archives of Pharmacy*, of Hanover, a note from Dr. Hauln, relative to a point in practical Pharmacy to which attention has already been called, but which may be, with utility, repeated here. It relates to the nearly complete disappearance of the odor of musk in preparations where this substance is associated, either with syrup of almonds or cherry laurel water. The knowledge of this peculiarity is important, especially to physicians, who without a cognizance of this fact will be led to the impression that the quantity of musk directed in a prescription had not been introduced.

This fact was noticed, as we have said, for the first time by M. Hauln; since then by M. Soubeiran, and more recently yet by M. Fauré, of Bordeaux. The last has been conducted on this subject to some interesting observations. He has ascertained that almond syrup only

marks the odor of musk when it contains *bitter* almonds. The milk of sweet almonds does not possess this property. Cherry laurel water, on the contrary, possesses it in a degree at least equal to bitter almonds. It is therefore simply the hydrocyanic acid which disguises the odor of the musk, by reason of its lively and penetrating odor, which, however, is less subtle than that of musk. And, in fact, if one swallows a spoonful of the mixture of musk in orgeat syrup or cherry laurel water, neither the odor or taste of the musk are at first appreciable; but in proportion as the odor and taste of the hydrocyanic acid disappears from the mouth, those of the musk are developed, and persist as long a time as if the dose had not been mixed in orgeat syrup or cherry laurel water.

At the time when M. Fauré published his observations, he remarked that it remained to be ascertained whether the action of hydrocyanic acid on musk, modified or not its medicinal properties, either during the influence that the acid exercises, or after it was dissipated. No experiments that we know of have been made since then on this subject.

*Ointment to aid the growth of Hair.* By J. KALLHOFERT.—Though I consider the formula of an ointment communicated in Buchner's *Reper-torium*, vol. 34, No. 2, by Mr. Steege, apothecary to the court, to be far better than the following, which is my own, I think I ought to make it known, as several eminent physicians, especially my friend, Dr. Se-delbauer, and myself, have found it highly efficient; individuals who had lost almost all their hair, by the use of this ointment preserved the few remaining, and promoted the growth of new ones.

*Unguentum contra Alopeciam.*

**R** Extracti Chinæ fusc. grana xv.

Rhataniae grana viii.

Succi citri med. gttis. xxx.

Balsam Indic.

" Nucist: expres.

Extract. Bardan. ana drachm. duas.

Camphor. triturat. grana xv.

Alcoholis 30° B. drachm. duas.

Medull. bovis, unciam un. et semis.

Ol. Provinc. unciam unam.

" Odoration. q. s.

Misce fiat unguentum lege artis.

*Lond. Chem. from Buchn. Rep.*